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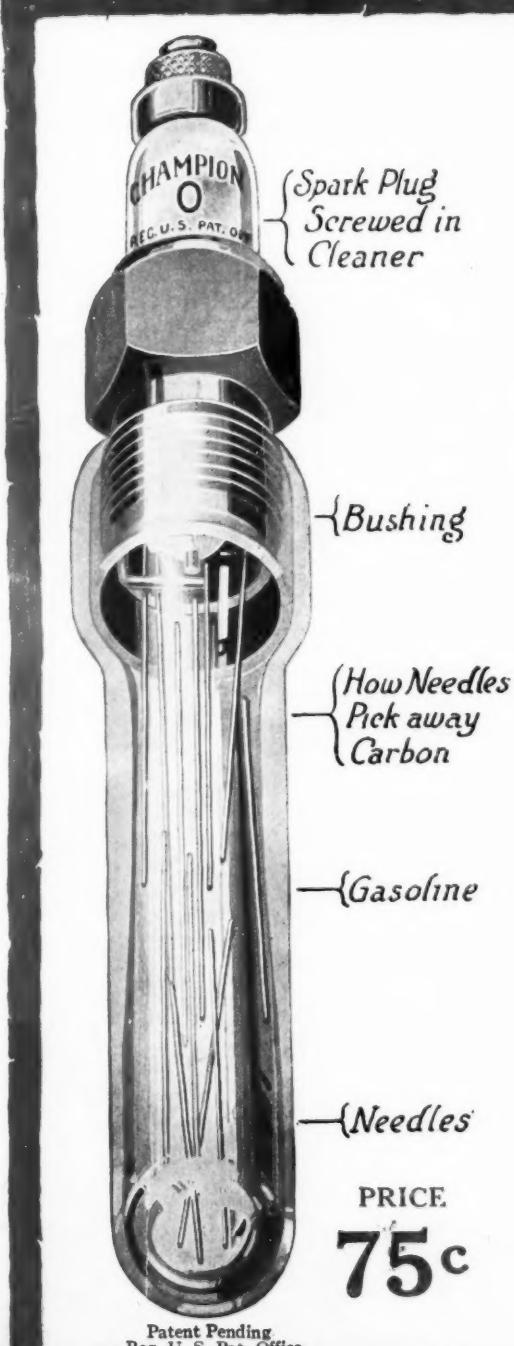
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AUTOMOBILE

Vol. XXXVI
No. 7

NEW YORK, FEBRUARY 15, 1917

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Clean Your Plugs This Easy Way

Fill the tube half full of gasoline — screw the plug into the bushing at the end — then shake.

That's all you have to do to clean your plugs when you use the

CHAMPION “MINUTE” SPARK PLUG CLEANER

In a minute or two you can clean a whole set.

Think what an improvement over the dirty, grimy task it used to be!

You don't even have to take the plugs apart.

The needles in the tube pick the carbon off the porcelain and the gasoline dissolves the oil.

The Champion “Minute” Cleaner saves a whole lot of time, temper and trouble.

It's a worry-less, work-less way of cleaning your plugs.

You want a Champion “Minute” Cleaner. Get one now.

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Manufacturers of Champion Toledo Spark Plugs

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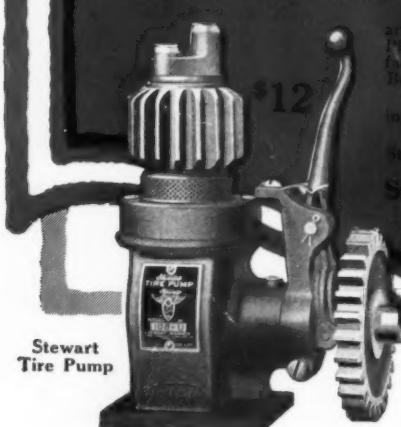
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And remember, Stewart Products make the hardest competition.

Take the Stewart Tire Pump for instance. It is standard equipment on many of the best cars. It is the one tire pump recognized by the motor car industry. Consequently, it is the easiest to sell—and hardest to compete with.

The same is true of the Stewart Warning Signals, Stewart Vacuum System, Stewart Speedometer, V-Ray Spark Plugs—and all other Stewart Products, including the famous combination Stewart Speedometer and Instrument Board for Fords, selling for \$11.25.

Don't waste your time, money and efforts trying to sell unknown, unadvertised accessories. "It will pay you to see that every car is Stewart equipped."

Stewart - Warner Speedometer
Corporation
Chicago U. S. A.

50

The AUTOMOBILE

VOL. XXXVI

NEW YORK—THURSDAY, FEBRUARY 15, 1917—CHICAGO

No. 7

Chandler Earns \$24.51 on Stock

Dividends Totaled \$700,000—
Surplus \$1,190,786—Gross
Profits \$2,401,862

CLEVELAND, Feb. 13—A net profit of \$1,716,166 is reported by the Chandler Motor Car Co. in its report for the year ended Dec. 31. This is equal to \$24.51 per share of stock. The company paid cash dividends aggregating \$700,000 on the \$7,000,000 capital stock outstanding and added the balance of \$1,016,166 to surplus.

Gross profits from the sale of its cars and parts, after deducting cost of labor, material and manufacturing expense, was \$2,401,862. Interest and other miscellaneous income was \$31,907, making total income \$2,433,769. Selling, advertising and general expenses amounted to \$717,604, which left the balance of net profits at \$1,716,165.

Orders on hand for delivery of cars during 1917 are 50 per cent greater than its entire production of 1916. F. C. Chandler, president of the company, in his remarks to the stockholders said in part: "New improved fireproof buildings have just been completed which double the floorspace and which will enable the company to take care of the increased production necessary to supply the growing demand for Chandler cars. The foreign business has shown a wonderful development, and we look forward to a very large business from this trade."

The condensed balance sheet of the company, at the close of business Dec. 31, 1916, appears in adjoining column.

Rickenbacher Back in U. S.

NEW YORK, Feb. 14—Eddie Rickenbacher arrived in this city from Wolverhampton, England, on Monday, after a visit of over 2 months in Europe to purchase two racing cars for this year's campaign. Rickenbacher was at the

Sunbeam plant for some time where he superintended the building of two six-cylinder, 150-hp. racers of 300 cu. in. displacement.

Mr. Rickenbacher states that if war is declared the cars will be left in England. They are equipped with aviation motors and aluminum bodies. One of the engines was tried out on the Brooklands track and a lap was made at the rate of 119 m.p.h. Mr. Rickenbacher will leave this city for Detroit and other cities and will be on the Pacific Coast for some time. He will return to this city in 3 weeks.

Federal Truck Capital \$2,000,000

DETROIT, Feb. 13—The stockholders of the Federal Motor Truck Co. met here to-day, and voted to increase the capital from \$500,000 to \$2,000,000. The increase entails distribution of a stock dividend of 100 per cent through transfer, of \$500,000 of surplus to the capital account. All of the officers and directors of the company were re-elected.

Dunlap Leaves Export Business

DETROIT, Feb. 13—C. H. Dunlap, former export manager for the Hupp Motor Car Co., has resigned the vice-presidency of an export company with which he has recently been connected, and gone to California. The change is made because of war conditions. Mr. Dunlap will announce his plans in the near future.

CHANDLER BALANCE SHEET

Assets	
Land and buildings	\$475,062
Good will	5,000,000
Cash	1,800,422
Customers' notes	14,215
Customers' accounts	53,181
Cars sold for export	123,287
Merchandise inventory	1,876,983
Taft Avenue Construction Co. stock	32,000
Advances to manufacturers	72,867
Prepaid expenses, etc.	30,830
Total	\$9,478,849
Liabilities	
Unpaid purchases and expenses	\$905,798
Dealers' deposits	113,928
Dividend payable Jan. 2, 1917	210,000
Accrued taxes, etc., not yet due	53,122
Reserve for contingencies	5,214
Capital stock outstanding	7,000,000
Surplus	1,190,786

Miller Sales Total \$7,583,605

1916 Increase from \$3,216,000—
Earnings \$952,952 in
15 Months

AKRON, Feb. 14—The Miller Rubber Co. increased its total sales from \$3,216,000 in 1915 to \$7,583,605.95 in 1916 with prospects from \$10,000,000 to \$12,000,000 sales for 1917.

The 1916 figures are for 15 months, owing to a change in the fiscal year. The company doubled the factory and land holdings in 1916. It is at present erecting a seven-story building.

The surplus on Oct. 1, 1915, was \$831,746.99. Earnings on Oct. 1, 1915, to Dec. 31, 1916, were \$952,952 with a total of \$1,784,699 less the common stock dividend of \$1,000,000 depreciation and expenses of increased capitalization of \$232,795.84 and dividends of \$259,958. With a total of \$1,592,753.94, the surplus on Dec. 31, 1916, was \$291,945.

The company will issue \$500,000 in new common stock. Present shareholders will have the right to purchase shares of the new stock at par.

To Relieve Detroit Coal Situation

DETROIT, Feb. 13—Detroit is just keeping ahead of collapse so far as coal is concerned. The Detroit Edison Co., which announced Monday that it had sufficient coal to keep running until Thursday without shutting off power from factories, hopes to extend the time when the coal en route to-day has been checked. All of Detroit is economizing in power as much as possible and a number of companies have made short shutdowns. Among them is the Michigan Steel Castings Co. which closed Monday and will resume operations Wednesday if the shortage is relieved. This company uses a considerable amount of power from the Edison Co. in operating its plant.

Mitchell 1916 Income \$1,188,398

Equal to \$9.50 a Share—Surplus Is \$361,619—Dividends Total \$187,500

RACINE, WIS., Feb. 14—The Mitchell Motors Co., this city, in the year ending Oct. 31, 1916, reports a net income of \$1,188,398, equal to \$9.50 a share on the 125,000 shares of stock outstanding. The surplus amounted to \$361,618, after paying dividends of \$187,500.

The income account is as follows:

Net operating profits.....	\$1,282,762
Other income	119,354
Total income	\$1,402,116
Taxes, extraordinary expenses and interest	213,718
Income for year.....	\$1,188,398
Mitchell-Lewis Motor adjustment.....	514,142
Balance	\$674,256
Special reserves	125,137
Balance	\$549,119
Dividend paid	187,500
Surplus	\$361,619

The balance sheet as of Oct. 31, 1916, follows:

Assets	
Cash	\$514,843
Notes and accounts receivable	491,726
Inventories	2,729,598
Deferred charges	34,072
Real estate, etc.....	2,501,632
Investments	41,073
Total	\$6,312,947
Liabilities	
Accounts payable	\$676,369
Dividends payable	187,500
Accrued wages, taxes, etc.....	4,184,032
Debenture notes	275,000
Reserves	110,000
Contingent items	175,000
Notes receivable, discounted	29,863
Capital in surplus, May 31.....	4,518,427
Surplus as annexed.....	361,618
Total	\$6,312,947

Cochrane with General Motors Truck Co.

DETROIT, Feb. 9—W. B. Cochrane has joined the forces of the General Motors Truck Co. of Pontiac, and will be in charge of Pacific coast business.

Myers General Engineering Co. Director

DETROIT, Feb. 9—T. P. Myers has been elected a director of the General Engineering Co. He is sales manager.

Cook on Goodrich Executive Staff

AKRON, Feb. 9—C. E. Cook has been appointed to the executive staff of the central office of the B. F. Goodrich Co. in Akron. He has been Pacific Coast manager for the company. Frank R. Carroll has been put in charge of the Coast territory. He was formerly manager of the Los Angeles branch.

Senate Caucus Quashes Webb Bill

WASHINGTON, Feb. 11—At attempt to attach the Webb bill as a rider upon the revenue bill was defeated in the Democratic caucus of the Senate held yesterday. It is believed that this kills the chances of this measure passing during

the present session. The proposed law would allow corporations to form joint selling agencies for foreign trade purposes.

Secretary Patchin of the Foreign Trade Council in New York interviewed Senators yesterday, and Senator Lewis made the proposal to tack the Webb bill on the revenue act. The suggestion was opposed strenuously, certain Senators saying that they would talk indefinitely and prevent it from coming to a vote if the measure appeared in the Senate.

Price Leaves Overland Sales

CHICAGO, Feb. 10—Charles W. Price has retired as distributor of Overlands in Chicago and surrounding territory and, at his request, the Willys-Overland, Inc., Toledo, has purchased his interest in the Overland Motor Co., the local distributing organization. Price's retirement has been caused by health conditions and outside financial interests. Joseph H. McDuffee, assistant sales manager at the Overland plant, has been placed in charge of the Chicago business.

Olympian Motor Co. Doubles Capital

PONTIAC, MICH., Feb. 9—The Olympian Motor Co. has increased its capital from \$1,000,000 to \$2,000,000 for general expansion purposes.

Aeroplane Makers Unite for Defense

Fifteen Form Aeronautic Mfg. Assn.—Output 175 Planes Weekly

NEW YORK, Feb. 12—Fifteen aeroplane manufacturing companies joined forces for the defense of the United States at a meeting in the Hotel Manhattan yesterday afternoon. The new league took the name of the Aeronautic Mfg. Assn. The members have a combined investment of \$30,000,000 and can turn out 175 aeroplanes weekly if need be.

Harry Bowers Mingle of the Standard Aero Corp., president of the association, sent the following telegram to President Wilson:

"Aeronautic manufacturers have today organized for the purpose of cooperating with the government. We pledge our full support and place our combined efforts and resources at your command."

The firms represented were: International Aircraft Co., Bourges Co., Curtis Aeroplane Co., Thomas Morse Aircraft Co., F. H. Flint Engineering Co., United Eastern Aeroplane Co., Gallaudet Co., Brook Aircraft Co., General Aeroplane Co., American Motoplane Co., Aeroplane Company, A. S. Heinrich Corp., Standard Aero Corp., F. F. Pierce Aero Corp., and Benoist Corp.

S. A. E. Aero Session Success

Standards Appreciated—War Films Shown—Talks on Gyroscope, Engines and Wings

NEW YORK, Feb. 10—The first aviation session of the Society of Automotive Engineers held yesterday proved an unqualified success. The two papers on standardization given in the afternoon evoked a vigorous discussion of which the most striking part was the obvious readiness of the aeroplane manufacturers to draw upon the store of experience and standards possessed by the automobile industry. There is no need for standards propaganda as there was when automobile standards were first proposed. On the other hand, the aviation industry is calling out for standards, fully appreciating the benefits which would result from their use, benefits not so much of price as quick supply and rapid replacement.

In the evening a crowd of over 350 gathered, and there were shown again the series of war films, which were a feature of the winter meeting of the society. These were followed by Mr. Sperry's paper on "Air Navigation Over Water." Mr. Sperry did not read the paper, but talked on the gyroscope and his various inventions, explaining clearly the operation of the different devices.

Following him, Prof. Pawlowski read his paper on "Wing Construction," which is reprinted elsewhere in this issue, and finally Leigh M. Griffith delivered his paper on "Aeroplane Engine Construction," which was digested very fully in the last issue of *THE AUTOMOBILE*.

Good Discussion

This paper was discussed more vigorously than either of the others, since there were a larger number present qualified to speak on the subject at issue. The majority of Mr. Griffith's contentions were not assailed, very few of the speakers apparently caring to commit themselves to the expression of any very different opinions. The discussion showed a distinct tendency to center about the spark plug as being the weakest spot in the present day aviation engine, and there seemed the general view that some drastic changes would have to be made, that mere petty improvement of the spark plug as we know it is not going to prove the final answer.

Innes Factory Manager of Chevrolet

DETROIT, Feb. 10—H. L. Innes has joined the Chevrolet Motor Co. as factory manager. His resignation from Dodge Bros. was recently reported in *THE AUTOMOBILE*.

M. & A. M. Attacks Revenue Bill

Admits Aeroplane Motor and Parts Makers to Membership —Reviews Morrison Act

NEW YORK, Feb. 13—"An additional unwarranted and burdensome tax upon industry" is the Administration's revenue bill, in the opinion of the executive committee of the M. & A. M. as stated at the monthly meeting held in New York headquarters last week. The claim is that the burden will fall heavily on a few States at first.

It was decided to admit aeroplane motor parts and accessories makers to the society. The Morrison bill proposing a Federal bureau for the registration of design was referred to Christian Girl, W. O. Rutherford, and James H. Foster to determine what attitude the association would take after a canvass of the membership. Dayton Engineering Laboratories Co. and the Parker Rust Proof Co. of America, Detroit, were admitted to membership.

Stoll General Motor Truck Sales Mgr.

PONTIAC, MICH., Feb. 9—O. E. Stoll has been appointed sales manager of the General Motor Truck Co. He will direct the selling policies over Pontiac. He succeeds W. K. Chilcott. Mr. Stoll has been manager of the company's Philadelphia branch.

Higbie and O'Hara Hayes Directors

DETROIT, Feb. 10—C. Higbie and J. F. O'Hara have been added to the directorate of the Hayes Mfg. Co.

Allen Manages Hall Kenosha Factory

KENOSHA, WIS., Feb. 10—C. E. Allen will manage the factory at Kenosha of the C. M. Hall Lamp Co., which the company now operates following its purchase from the Badger Brass Mfg. Co. He has been superintendent of the Detroit plant.

Hodge Heads Traffic Committee

DETROIT, Feb. 9—The Detroit traffic committee of the National Automobile Chamber of Commerce held its monthly meeting yesterday. New car service rules as formulated by the railroad and approved by the interstate commission were submitted to the committee by J. S. Marvin, general traffic manager of the N. A. C. C., and were discussed. The committee believes that the new rules will be valuable to the industry since they will enforce the home routing of cars.

Election of officers for the committee

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was held, and the following were selected for this year: E. N. Hodges, traffic manager of the Hupp Motor Car Co., chairman; J. A. Gardner, traffic manager of the Hudson Motor Car Co., vice-chairman; Hugh Higginbottom, traffic manager of Dodge Brothers, secretary. Among the factories represented at the meeting were the Willys-Overland Co., Chalmers Motor Car Co., King Motor Co., Hudson Motor Car Co., Cadillac Motor Car Co., Anderson Electric Car Co., Studebaker Corp., Hupp Motor Car Co. and Dodge Brothers.

Ball in Milwaukee Engineering School

MILWAUKEE, WIS., Feb. 12—J. D. Ball, Schenectady, N. Y., late of the consulting engineering department of the General Electric Co., and assistant to Dr. Charles P. Steinmetz for the past 9 years, has accepted the appointment of professor of electrical engineering in the Milwaukee School of Engineering. Mr. Ball is a graduate of the University of Illinois and a member of the American Institute of Electrical Engineers.

Three More Makers for Cleveland

Companies Manufacture Automobiles, Trucks and Electric Vehicles, Respectively

CLEVELAND, Feb. 9—Three automobile manufacturers will move their factories from Michigan to Cleveland next fall. One company is planning to manufacture touring cars, another will turn out trucks of extra heavy pattern, and the third will manufacture electric vehicles. These concerns follow on the heels of the Grant, Abbott and Hal companies, which have moved from other cities here within 6 months. One of the three manufacturers, whose names must be withheld at this time, is among the largest automobile makers in America.

Thompson Is Stutz General Manager

INDIANAPOLIS, Feb. 13—William N. Thompson, sales manager of the Stutz Motor Car Co., has been made treasurer and general manager of the company, succeeding the late Henry F. Campbell. His place is taken by Thomas Marshall, formerly with the Stutz company and more recently with Willys-Overland, Inc.

Jones Resigns from Empire

INDIANAPOLIS, Feb. 13—Tom Jones, export and advertising manager of the Empire Automobile Co., this city, has resigned. He will sail for London to become affiliated with a large export house. Mr. Jones was formerly connected with the Marion and R-C-H companies.

More Car Factories for War Use

Peerless, Studebaker and Cruiser Offer Plants—Firestone Tire Volunteers

WASHINGTON, Feb. 14—Offers from automobile and other manufacturers continue to deluge the war department, stating that their facilities are at the service of the government if the occasion demands it. Peerless Motor Car Co., Cleveland, Studebaker Corp., South Bend and Detroit, and the Cruiser Motor Car Co., Chicago, have volunteered their plants during the past week.

Firestone Tire & Rubber Co., Akron, is willing to place its facilities at the service of the government, the Danubil Co. of New York, manufacturers of engineers' packing materials; the Taylor Instrument Co. of Boston, manufacturers of recording devices and gages; the Warner & Swazey Engineering Co., Cleveland; the United Glove and Rubber Mfg. Co. of Washington, and the Gray Motor Co. of Detroit are among those who have indicated their readiness to use their factories for war purposes.

The government has conferred with Christian Girl, president of the Standard Parts Co. of Cleveland, requesting the company's assistance in establishing a repair plant for motor trucks in El Paso, Tex. The government wishes the company to conduct such a service station until the war department can take it over.

Hudson Gets Government Shell Order

DETROIT, Feb. 9—The Hudson Motor Car Co. has received a small order for shells from the U. S. Government to enable it to put in sufficient equipment to train employees for such work in event of war needs.

Waldron to Talk on Aeronautics

DETROIT, Feb. 10—Maj. S. D. Waldron of the United States Army will speak on "Aeronautics in War" at a meeting, Feb. 16, of the Detroit chapter of the Sons of the American Revolution.

DeCou with Smith Motor Truck

DETROIT, Feb. 12—J. W. DeCou has become production manager of the Smith Motor Truck Corp. Mr. DeCou was formerly the production manager for the Thomas B. Jeffrey Co.

Detroit Section Nominates Waldron Chairman

DETROIT, Feb. 8—S. D. Waldron, formerly connected with the Cadillac Motor Car Co. and vice-president of the Packard Motor Car Co. in charge of engineering, yesterday received the nomina-

tion for chairman of the Detroit section of the Society of the Automotive Engineers. C. C. Hinckly, chief engineer of the Chalmers Motor Car Co., was nominated vice-chairman; G. M. Holley of Holley Bros. for treasurer; W. B. Stout, an Aircraft Motor Engineer of the Packard Motor Car Co., for secretary, and L. D. Bollon, president of the Ainsworth Mfg. Co., for section member of the National Nominating Committee. Nomination committee for the Detroit section consisted of: H. W. Alden, of the Timken Detroit Axle Co.; J. G. Vincent, of the Packard Motor Car Co., and H. A. Brown, Jr., of the Hyatt Roller Bearing Co.

Indiana S. A. E. To Discuss Cork

INDIANAPOLIS, Feb. 10—The History of Cork from the Tree to the User will be the subject of a paper to be read by H. W. Prentis of the Armstrong Cork Co. at the Feb. 16 meeting of the Indiana Section of the Society of Automotive Engineers in the Assembly Hall of the Claypool Hotel. In addition to this paper, Mr. Kempter of the Geuder, Paeschke & Frey Co., Milwaukee, will give a talk on pressed steel.

Senate Approves Taxing of Excess Profits

WASHINGTON, Feb. 13—The Democratic members of the United States Senate in caucus have approved the emergency revenue bill as it passed the House, under which bill the excess profits item appears. This item has caused a vigorous protest to be made by manufacturers throughout the country. It places a tax of 8 per cent on the net profits of corporations, joint stock companies or associations, insurance companies and partnerships, which are in excess of \$5,000 and in excess of an amount equivalent to 8 per cent of the actual capital involved. That is, before the tax attaches there is a flat reduction of \$5,000 from the total net profits and a further reduction of 8 per cent on the actual capital invested.

Bakelite Is Cleveland S. A. E. Subject

CLEVELAND, Feb. 13—R. P. Jackson, engineer of the Westinghouse Electric & Mfg. Co., will present a paper on Fabricated Bakelite Materials for Application on Automobiles at a meeting of the Cleveland section of the Society of Automotive Engineers. The meeting will be held Feb. 16 at the Hollenden Hotel.

Monroe Controls Middle West Sales

DETROIT, Feb. 14—R. O. Monroe has been made manager of the Middle West sales for the Monroe Motor Co., with offices at South Bend, Ind. He is a son of R. F. Monroe, president of the company.

Dodge To Build Trucks

Company Considering Plan To Add Delivery Car of Under 1000 Lb. Capacity

DETROIT, Feb. 13—Dodge Bros. will bring out a small truck. Reports have been circulated that the Dodge company has already brought out a commercial vehicle. These reports are untrue, although the Dodge company has under consideration the manufacture of a light delivery car which will probably not exceed 1000-lb. capacity.

An official of the Dodge company explained to-day that there had been urgent requests from the dealers for a small truck, and it is to meet this demand that preliminary designs for a small unit are now being formulated. Before the truck is actually built, however, a few will be made up and given an exhaustive road test so that when the design is perfected, production will be uninterrupted by errors which might have occurred due to haste. The Dodge company has discouraged the overloading of its chassis with truck bodies that are too heavy, but to meet the requirements where it has been absolutely necessary, a few chassis have been furnished which are the same as the stock passenger cars except for oversized tires, heavier springs, etc. No efforts have been made to push this side of production, however; in fact, the Dodge company has discouraged the idea as much as possible.

New Directors in Michigan Copper & Brass Co.

Detroit, Feb. 13—The stockholders of the Michigan Copper & Brass Co. met here to-day and elected new officers and directors as follows:

Officers: D. M. Ireland, president; J. J. Whitehead, first vice-president; H. H. Smith, second vice-president; A. L. Simmons, secretary; John S. Connell, treasurer. Directors: C. S. Mott, of the Weston Mott Co.; A. P. Sloan, of the United Motors Corp.; W. P. Chrysler of the Buick Motor Co.; B. G. Goether, of the Hyatt Roller Bearing Co.; J. H. Mallory; E. C. McCrone; D. M. Ireland; H. H. Smith and J. J. Whitehead.

Mr. Whitehead and Mr. Smith are new officers. All of the directors with the exception of Mr. Ireland, Mr. Whitehead, and Mr. Smith are new members of the directorate. There was no action taken on extra cash or stock dividends, though the surplus and earnings of the company are at this time understood to be equivalent to 80 per cent on its \$1,000,000 capital.

The directors have authorized expendi-

ture of \$200,000 for expansion. The company has orders booked for 20,000,000 lb. of product. The net earnings for the past year were \$972,494.75, equivalent to 87 per cent on the capital stock. The year's dividend disbursements included 125 per cent stock dividend and aggregated \$720,760, leaving an accumulated surplus of \$844,411.87. Compared with \$592,677.12 at the end of 1915, the company's balance sheet this year shows assets of \$2,181,827.89, current liabilities \$164,995.14, making a net working capital or \$1,244,613.21. There is no funded debt. The new controlling interests hold 52,000 shares of stock, and proxies covering 20,000 additional out of 11,485 shares outstanding.

Ford Starts Newark Plant

KEARNY, N. J., Feb. 13—The Ford Motor Co. has started construction of its plant on the New Jersey meadows adjacent to Kearny, where 80 acres of ground have been purchased. It is expected that the structure, which will be four stories, will be completed in about a year. It is stated that this location will afford better transportation facilities than the Long Island City plant which has been inadequate to supply the demand for domestic and foreign trade.

197,687 Cars in Texas

AUSTIN, TEX., Feb. 13—On Jan. 1 there were registered 197,687 cars and trucks in Texas, as compared with a total of 137,807 on Jan. 1, 1916; an increase of 44 per cent.

These registration figures are not by any means complete, for the reason that there are thousands of cars in use in Texas which, in one way and another, have evaded registration. It is estimated, however, that the total number in the State is perhaps close to 215,000.

Happy Farmer Tractor Enlarges

LACROSSE, WIS., Feb. 12—To make possible a production of at least 2800 Happy Farmer tractors during the calendar year the LaCrosse (Wis.) Tractor Co., the recent consolidation of the Sta-Rite Engine Co., LaCrosse, and the Happy Farmer Tractor Co., Minneapolis, has leased the former plant of the Summit Stove Works at LaCrosse and will use it to handle the overflow from the main plant in that city. The company started out to manufacture about 1500 tractors this year, but up to Feb. 1 had booked guaranteed orders for 2800 machines.

Blanchard, of Firestone, Dead

AKRON, Feb. 13—Frank Blanchard, sales manager of the Firestone Tire & Rubber Co., died Monday as the result of a serious operation.

THE AUTOMOBILE

Batavia to Make Solid Tires**Will Take Over Simplex Rubber Co. Patents and Property—Refinancing**

BATAVIA, N. Y., Feb. 10—The Batavia Rubber Co., this city, and the Simplex Rubber Co. of America, Ossining, N. Y., will merge, and the latter company is to assign all its property, patent rights and agreements to the local company, according to an agreement just announced.

The Batavia company has for some time contemplated adding to its production solid rubber tires for trucks and also certain classes of mechanical rubber goods. The Simplex Rubber company has been operating since November, 1916, under patent license rights granted by the Simplex Rubber Co. of Willesden, England. As this company has been showing satisfactory results from its operations, the directors of the local company have arranged for the merging and sale of the company.

By the new merger the Batavia company will increase its capital stock and will issue stock in the ratio of \$85 preferred for each \$100 of Simplex preferred and \$55 of Batavia common for each \$100 of Simplex common. The capital stock of the Simplex company is \$100,000 preferred and \$200,000 common. The Batavia company is also to assume the outstanding notes of the Simplex company, amounting to about \$50,000, and also their current liabilities for materials and supplies, etc.

Form Rubber City Clearing Co.

AKRON, Feb. 10—The Rubber City Clearing Co. has been formed here with a capital of \$100,000, to engage in the automobile accessories business. C. E. Williams of the Williams Motor Co. filed the application for incorporation.

Wolverine Buys Factory Site

DETROIT, Feb. 9—The Wolverine Tractor Co. has purchased land in West Dearborn, Mich., and will erect a factory and homes for workers.

Ionia Body Plant at Grand Rapids

GRAND RAPIDS, MICH., Feb. 12—The Ionia Auto Body Co. has purchased one of the plants of the Heinz Pickle Co. at this city for \$85,000 and will move here in the near future.

Nice Ball Bearing to Build

PHILADELPHIA, Feb. 10—The Nice Ball Bearing Co., 504 Land Title Building, has purchased a large piece of ground on Hunting Park Avenue, on which it

plans to erect a building for the manufacture of ball bearings. The ground measures 987 by 528 ft. and was bought for \$71,365. The Nice Ball Bearing Co. was incorporated by Budd G. Nice and Frank Beemer less than a year ago and has since succeeded the Pressed Steel Manufacturing Co., also maker of ball bearings.

American Motors Starts Manufacture

PLAINFIELD, N. J., Feb. 12—Production has started at the plant of the American Motors Corp. here. W. H. Crowley, recently wholesale manager for the Saxon Motor Co. of New York, has been made a district sales manager and is on the road in New York and Pennsylvania. C. W. Govan has likewise been made district sales manager for New England and Long Island. H. M. Applegate, former advertising manager for Lee tires, will look after the advertising.

Western Carbureter to Build

ALMA, MICH., Feb. 10—The Western Carbureter Co., this city, recently incorporated for \$120,000, has let contracts for a factory. Machinery will be installed within 60 days.

Grant-Lees Addition Nearly Ready

CLEVELAND, Feb. 13—The Grant-Lees Gear Co. addition on East Sixty-ninth Street will be ready for occupancy March 1. The factory addition embraces 30,000 sq. ft., is three stories high, of concrete and steel. The new facilities are expected to turn out 100,000 transmissions yearly.

Duplex Truck Plans Plant

LANSING, MICH., Feb. 12—The Duplex Truck Co. has moved its executive offices from the old city hall building on East Michigan Avenue to the new Porter building at Capitol Avenue and Washington Street. By the latter part of August the company expects to be in its own office building at Mt. Hope and Washington Avenues. Plans are going ahead for the erection of a new factory building in this section of the city, and it is expected the building will be equipped by next fall so that the equipment in Charlotte, Mich., where the company now manufactures its trucks, may be brought here at that time.

Duesenberg Plant for Newark

CHICAGO, Feb. 10—The Duesenberg Motor Co., this city, it is stated, is contemplating moving its plant to the Atlantic coast, where it will go in for large production work. Negotiations have been made for a 16-acre plant in Newark, N. J., where, it is stated, through better working and shipping conditions, the company will be able to give more attention to its production of aeroplane, automobile and motor boat engines.

Bethlehem Trucks in Two Models**10,000 1 1/4- and 2 1/4-Tonners for 1917—Prices Are \$1,125 and \$1,665, Respectively**

ALLENTEW, PA., Feb. 13—Two truck models have been placed on the market by the Bethlehem Motors Corp., this city, one of 1 1/4-ton and the other of 2 1/4-ton capacity. This concern, which has only been organized a few months, plans a production of 10,000 of these vehicles during the calendar year. They are of conventional design assembled from standard components and will be produced both as stripped chassis and in several standard body types. Specifications are:

Capacity, lb.	2,500	4,500
Price	\$1,125	\$1,665
Wheelbase, in.	126	144
Tires, front	34 x 3	34 x 4
Tires, rear	34 x 4	34 x 6
Bore, in.	3 3/4	4
Stroke, in.	4 1/4	4 1/2
N. A. C. C. hp.	22.5	25.6
Gear-ratio in high gear	7.4-1	8.3-1
Final drive	Internal Gear	

A Lycoming engine is used on the smaller model and a North American on the larger, both being incorporated in unit with their clutches and gears as unit power plants suspended at three points from the main frame. The smaller engine is block-cast and the larger cast in pairs, both having valves to the left.

Thermo-syphon water circulation through long, square-tubular, sheet-metal-cased radiators is employed on both models, and both have Bosch single magneto ignition with hand spark advance. They are not provided with governors. Gravity feed is used for the fuel line.

Both models drive through dry-disk clutches and three-speed selective gears, made by the Detroit Machine Co., to Russel internal-gear-driven rear axles, from which torque and propulsion are taken by the Sheldon springs.

McCord Completes Refinancing

DETROIT, Feb. 9—McCord Mfg. Co. of Detroit and Chicago has dissolved its \$750,000 organization; and the McCord Mfg. Co., Inc. of Milbrook, N. Y. and Detroit has been incorporated for \$1,375,000.

Drexel Acquires Body Equipment

CHICAGO, Feb. 10—The Drexel Motor Car Co. has now acquired full equipment of the Staver body building plant, Chicago. A section of what was formerly the Staver factory has been occupied by the Drexel concern for some time. The plant recently became the property of the Studebaker Corp., which leased part of it to the Drexel company.

Trucks Favored in N. Y. Bills

Scientific Report Ordered by Governor to Determine Equitable Tax

NEW YORK, Feb. 13.—That motor truck owners and operators in New York state have partially succeeded in their efforts to change the present drastic Hewitt-Wells bills taxing trucks from double to fourteen times those of 1916 is manifested in the favorable attitude of Governor Whitman, who promised to create a new commission to determine a new schedule of fair and equitable fees at a public hearing recently. Arguments at this meeting were so convincingly put forth that the Governor practically agreed to form a new commission to consist of a road engineer, a state engineer and a motor truck engineer to make a scientific report on the entire matter and then report back to the Legislature for final action.

On Feb. 7, the next day after the public hearing, Senator Murphy introduced a bill into the Senate providing that such a commission be appointed by the Governor and similar action was taken by Assemblyman Law in the Assembly.

Another bill of perhaps equal importance was introduced into the Senate by Senator Slater and provides for the exemption of motor trucks and buses from local and general taxation in lieu of the present increased fees as ratified by the Hewitt-Wells bills. If the Slater bill is passed, and from indications it seems that it will, motor truck owners and operators will have much cause for rejoicing because the personal property and local taxes are of greater amount than the registration fees in practically all cases. If trucks are thus exempted from these taxes they will be in the same class as the passenger cars in the state so far as a single tax is concerned, for they have paid no personal property tax since the present tax of a fixed sum per horsepower rating went into effect several years ago.

The great benefit accruing from the exemption of local and general taxation on trucks and buses may be gaged by a comparison of one or two sizes of trucks under the flat \$5 fee per year as in 1916 and the proposed fees according to the Hewitt-Wells bill if the local and general taxes are removed. For example: a conventional 1-ton truck costing approximately \$1,650, including an ordinary body, in 1916 had to pay a registration fee of \$5 plus about 2 per cent of the valuation in local and general taxation, which amounted to \$33, giving a total of \$38.

With the present fees as scheduled and ratified by the Hewitt-Wells bill, the reg-

istration fee for the same truck, weighing between 2 and 3 tons, would amount to \$15. This shows an actual saving to the owner of \$23, provided the local and general taxes are eliminated. This saving will be proportionally increased as the size and value of the truck is increased, for the reason that the registration fees do not increase in the same ratio.

Ostrom Resigns from Locomobile

BRIDGEPORT, CONN., Feb. 13—C. C. Ostrom, purchasing agent of the Locomobile Co. of America, has resigned to become associated with the Parish Mfg. Co., Reading, Pa., and Detroit. J. E. Forgy, present assistant purchasing agent, succeeds Mr. Ostrom.

Sterling Tire Corp. Capital \$2,500,000

RUTHERFORD, N. J., Feb. 10—J. A. Miller of this city has incorporated in Delaware the Sterling Tire Corp., with a capital of \$2,500,000 to manufacture tires. Otto Basten of East Rutherford, and Bartlett Greene, Passaic, are also interested in the company.

Ford Not with Export House

NEW YORK, Feb. 13—H. W. Ford, president and general manager of the Saxon Motor Car Corp., Detroit, is not a director or stockholder in the Foreign Industrial Corp., as was stated in THE AUTOMOBILE for Feb. 1.

Russia Can Import Motor Vehicles

NEW YORK, Feb. 10—In THE AUTOMOBILE for Feb. 1 it was stated that the importation of automobiles and trucks into Russia had been prohibited. This was incorrect, as the vehicles prohibited do not include motor vehicles, the latter being covered by a special provision in the commercial treaty with France.

Must File Standard Roller Claims

PHILADELPHIA, Feb. 9—Standard Roller Bearing Co. creditors must file their claims before Feb. 23, according to a decree handed down by Judge Thompson in the United States district court yesterday. Any objections to the proposed purchase plan must be entered before the same date. Similar decrees were filed by Judge Rellstab in the United States district court at Trenton early this week.

Gamble Resigns from Maxwell

DETROIT, Feb. 9—T. S. Gamble, assistant sales manager of the Maxwell Motor Co., Inc., has resigned his position. Mr. Gamble will join an advertising company and have headquarters at Cleveland.

Goodyear May Take K-S Plant

AKRON, Feb. 14—It is reported that the Goodyear Tire & Rubber Co. will take over the local plant of the Kelly-Springfield Tire Co., which is moving to Cumberland, Md.

Annual Registration For D. C.

Tax of \$5 Yearly Instead of Permanent License—Md. Cars Included

WASHINGTON, Feb. 13—The District of Columbia appropriation bill just passed by the Senate, and which is now before the House for action, increases the District's automobile tax as follows:

All automobiles in the future must pay a tax of \$5 annually instead of a permanent license of \$2 as heretofore, on all cars up to 30 hp. and an annual fee of \$10 on all cars over 30 hp.

In addition, cars from Maryland must get annual licenses hereafter unless Maryland repeals its present law under which District car owners are compelled to take out Maryland licenses.

Record Show for Boston

BOSTON, Feb. 13—All previous records will be broken at the local automobile show, which opens in Mechanics Building and Horticultural Hall on March 3. To date there are eighty-six passenger vehicles and forty-two different makes of trucks. There will be four makes of electric passenger cars and two steam cars, the Stanley and Doble. The Boston show has had applications from 110 passenger car makers, but many of these were unable to secure space because much of it was given to the truck companies.

The Automobile Salon, which opens March 5 in the Copley-Plaza Hotel, is new to New England automobile trade. With few exceptions most of the cars shown in the Salon will also exhibit in Mechanics Building. The Salon will be treated as a separate show entirely, and an admission of \$1 will be charged. Only one admission will be charged for Mechanics Building and Horticultural Hall.

Newark Show in Palace Ballroom

NEWARK, N. J., Feb. 15—The Newark Automobile Show has been transferred from the First Regiment Armory to the Palace Ballroom. The date, beginning Feb. 24 and continuing for a week, remains the same. The change in place is made because the armory may be needed for military purposes.

Suit Against Stewart-Warner by Payton

CHICAGO, Feb. 9—The filing of the Stewart-Warner Speedometer Corp. suit alleging infringement of its vacuum fuel feed system patents by the Sparks-Washington Co. and the Heinz Electric Co., as announced last week, has brought to light the fact that a previous suit, in which the Stewart-Warner company was alleged to infringe, was filed March 29, 1916, by

A. L. Payton, a garage owner of this city. It now develops that the Sparks Withington Co. has arranged with Mr. Payton to manufacture the Sparton system under a patent license.

Mr. Payton states that he now controls seven patents that have been issued to Seager, Harrington, Noyes Payton, and also five others which are not yet issued. Mr. Payton states that these patents cover both the fuel feed system and the carburetor and it is under these patents that the Sparton system has been manufactured.

It is expected that the case will come up within the next 60 days.

Maxwell Buys Another Dayton Factory

DAYTON, OHIO, Feb. 10—The Maxwell Motor Co., Inc., has purchased the plant of the Manufacturers' Production Co., here, and will use it for the manufacture of enclosed bodies. This addition makes three plants in Dayton belonging to the Maxwell company.

Porter Body Co. Organized

YPSILANTI, MICH., Feb. 8—The Porter Body Co. has been organized with \$30,000 capital to manufacture automobile parts. It succeeds the Globe Truck Co. in business. Officers include: David Killins, president; G. E. Roiter, vice-president; G. Killins, treasurer, and B. Killins, secretary.

All Season Gets Briscoe Order

DETROIT, Feb. 14—The All Season Body Co. has been incorporated for \$500,000 to take over the plant of the Page Bros. Buggy Co., Marshall, Mich., and manufacture automobile bodies. The Briscoe company has placed an order for 5000 bodies with the new company. The officers of the new corporation are: W. L. Page, president; J. A. McAvoy, vice-president; E. E. Page, secretary; W. J. Dibble, treasurer.

THE AUTOMOBILE

Harroun Rushes Construction

Machine Shop and Assembly Building To Be Completed Soon—Production in March

WAYNE, MICH., Feb. 9—Within 15 days, the machine shop and assembly building of the Harroun Motors Corp. factory will be practically completed. All of the structural work has now been erected for these two buildings, and the work to be done is of a nature that renders progress quite rapid. This is mainly roof tiling and glazing. The buildings are arranged in the form of a T. The stem of the T is a long saw-tooth building with 105,000 sq. ft. of floor surface. It is 750 ft. long and 140 ft. wide, and intended to be a progressive assembly plant and warehouse.

The top of the T is formed by the machine shop, which is a three-story building, 75 ft. deep by 540 ft. long, having a total floorspace of 405,000 sq. ft. At present, only the first floor of this will be built.

The steel work for the saw-tooth building and machine shop has all been erected, and all the brick work and side wall sash on the saw-tooth building are put in place and ready for glazing. The brick work on the machine shop is now being done, and these two buildings are the ones which will be practically completed in 15 days.

The power house and coal pocket which has a capacity for a full winter's supply of coal, is now ready for the erection of the steel, all the concrete having been poured. It is estimated that the buildings will be ready for the setting of machinery and the receiving of materials for manufacture by March 1.

Up to date, the A. J. Smith Construc-

tion Co., which is doing the work, has been paid \$250,000 for construction, of which \$115,000 is represented in the steel work alone and the balance in concrete, labor, etc. The entire building is in charge of the construction company, which is the same concern that built the latest Paige plant, the original Hudson plant, several of the Maxwell buildings, the Kelsey Wheel factory, and a number of others. The remaining work will cost \$150,000.

Present plans call for the beginning of production shortly after March 1.

Sues Ford Motor Co. and Prudden Wheel

DETROIT, Feb. 10—Dr. G. A. Trueman has filed suit against the Ford Motor Co. and the Prudden Wheel Co. for \$100,000. Dr. Trueman experienced an accident which he claims lost him \$100,000 in earnings, and states that the accident resulted when the front wheel of his Ford car broke down. The Ford company states that it exercised all possible care in its selection of the wheel and that the plaintiff did not buy from them. The Prudden company pleads that it owed no duty to the plaintiff since it exercised all reasonable diligence in inspecting the wheel when it was sold to the Ford company.

Plan Sale of National Tire & Rubber

EAST PALESTINE, OHIO, Feb. 9—The terms of sale of the National Tire & Rubber Co. have been concluded. The plant and good will are to be transferred to an Ohio corporation now being organized, which expects to capitalize at \$1,000,000.

Torbensen Axle Adds 30,000 Sq. Ft.

CLEVELAND, Feb. 10—The Torbensen Axle Co., this city, is adding 30,000 sq. ft. to its plant. The addition comprises two buildings, one at the rear of the



Machine shop and assembly building of Harroun Motors Corp., Wayne, Mich., to be completed this month

main factory, with dimensions of 220 by 100 ft., and the other on the front end, 10 by 80 ft. The additions will be finished in 60 days at a cost of \$150,000.

With these enlargements the Torbensen company expects to double its axle output this year. Last year the plant manufactured 30,000 axles.

The company is introducing a complete new line of front axles for commercial cars, and also 3½ and 5-ton rear axles known as the Torbensen drive.

Republic Truck Plans Capital Increase

DETROIT, Feb. 10—The Republic Motor Truck Co., Alma, Mich., will ask its stockholders to approve an increase of capital stock from 62,500 shares of no par value to 100,000, on Feb. 28.

The plant is said to be earning at a rate of \$750,000 annually on its present capital, stock of which is selling at about \$65. Directors propose to issue 15,000 shares of the new stock at \$100 a share to stockholders, though at this time it is not known how the difference between the present selling price and \$100 will be made up.

Briggs & Stratton Capital \$250,000

MILWAUKEE, WIS., Feb. 12—The Briggs & Stratton Co., this city, manufacturing ignition systems, electrical specialties, etc., has increased its capital stock from \$50,000 to \$250,000. The company is building a new plant, costing \$100,000, on Hopkins Street, near Teutonia Avenue, which is to be ready for occupancy about April 1.

Bimel Spoke Increases Capital

PORTLAND, IND., Feb. 9—The Bimel Spoke & Auto Wheel Co., Portland, Ind., has increased its capital stock by issuing \$50,000 preferred.

Perfection Coil Spring Increases Capital

JACKSON, MICH., Feb. 12—The Perfection Coil Spring Co. has increased its capital from \$20,000 to \$100,000.

Hydraulic Steel 125% Dividend

Stock Distribution To Be Made Soon—Making Common Stock \$4,500,000

CLEVELAND, Feb. 9—The Hydraulic Pressed Steel Co. to-day announced that a stock dividend of 125 per cent on the common stock will be made soon. The board of directors proposes to increase the common capitalization from the present \$1,500,000 to \$4,500,000. Of the new stock \$1,875,000 would be used as the stock dividend, \$875,000 would be used in connection with acquisition of the Cleveland Welding & Mfg. Co., which was paid for part with cash out of earnings, and \$250,000 of the stock would remain in the Hydraulic treasury. The company has outstanding \$1,000,000 preferred. The annual meeting was adjourned until March 14 in order to give sufficient time for formal notice of the plans.

Hall Assets Total \$1,209,778

DETROIT, Feb. 10—Assets of \$1,209,778 are disclosed in the consolidated balance sheet of the Hall Lamp Co. as of Jan. 1, 1917. This figure is based on the local and Badger Brass plants. Of this amount cash is \$19,819; accounts receivable, \$155,031; inventories, \$472,848; plant, machinery and equipment, \$518,565; real estate, \$40,262; capital stock, \$750,000, and surplus, \$1,209,776.

Accounts payable total \$32,701, while accrued expenses total \$3,291; deferred, \$3,242; patents, good will, contracts, etc., are set at \$1.

Rubber and Copper Prices Higher

NEW YORK, Feb. 14—Rubber and copper prices featured last week's market activities with rises. Rubber, on account of the German submarine warfare, rose 4 cents a pound on Para, and 7½ cents on Ceylon. Copper, on account of its scarcity and big demand, has reached 34½ cents a pound, or a gain of ½ cent

for the week. Tin dropped \$2.50 per 100 lb. to \$54.50.

Though tire profits last year were lowered by the rising costs of rubber and other materials, it is stated that several of the companies will not be hampered by the present rise. One of the large companies has enough crude rubber on hand to run its plant at capacity until next July. This rubber was bought far below the present market.

Reports covering the world's total production of crude rubber indicate that the 1916 output amounted to 178,000 tons, of which 114,000 tons, or 64 per cent, were consumed in America. The consumption of rubber in America has more than doubled since 1914. The great rubber plantations of the East now produce about 75 per cent of the total and promise to show a decided increase for 1917. It is expected that this year's crop will amount to 235,000 tons. About 1,412,000 acres are known to be under cultivation.

Hoover Gross Earnings \$1,310,000

DETROIT, Feb. 9—The Hoover Steel Ball Co., Ann Arbor, Mich., reports gross earnings for the past year of \$1,310,000. The gross in 1915 was \$493,000, and in 1914 it was \$163,000.

Motor Products to Issue Notes

DETROIT, Feb. 10—The Motor Products Corp. proposes to stockholders a plan to issue \$1,000,000 notes, maturing serially every 6 months over a period of 5 years. The note issue will be made to fund the purchase of the plant formerly occupied by the Lozier Motor Co. The plant was bought during the past year, and provided sufficient space for the consolidation of all operations by the local plants of the Motor Products Corp. into a single unit.

In the 8 months ended December the volume of business transacted by the corporation amounted to \$4,072,043, or on a basis of \$6,108,064 per annum. The company now has on its books unfilled orders amounting to \$6,000,000. The earnings for the 8 months were on the basis of about \$11 a share per annum on the outstanding capital stock.

In the 8 months ended December, 1916, the Motor Products Co. transacted business amounting to \$4,072,043, or at the rate of \$6,108,064 per year, \$11 per share on the common stock. Unfilled orders amount to \$6,000,000.

Dividends Declared

Maxwell Motors Co., quarterly of 2½ per cent on common; regular dividends on preferred.

Pratt & Whitney Co., quarterly of 1½ per cent on preferred, payable Feb. 20 to stock of record Feb. 8.

Studebaker Corp., quarterly of 2½ per

Daily Market Reports for the Past Week

Aluminum, lb.	.58	.58	.58	.58	.58	...
Antimony, lb.	.25	.26	.33	.33	.33	+ .08
Bessemer Steel, ton.	65.00	65.00	65.00	65.00	65.00	...
Copper, Elec., lb.	.34	.34	.34	.34½	.34½	+ .00½
Copper, Lake, lb.	.34	.34	.34	.34½	.34½	+ .00½
Cottonseed Oil, bbl.	12.50	12.55	12.60	12.74	12.74	+ .24
Fish Oil, Menhaden, Brown, gal.	.74	.74	.74	.74	.74	...
Gasoline, Auto, bbl.	.23	.23	.23	.23	.23	...
Lard Oil, prime, gal.	1.40	1.36	1.36	1.36	1.36	— .04
Lead, 100 lb.	9.50	8.30	9.00	9.50	9.50	...
Linseed Oil, gal.	.94	.94	.94	.94	.94	...
Open-Hearth Steel, ton.	65.00	65.00	65.00	65.00	65.00	...
Petroleum, bbl., Kans., crude.	3.05	3.05	3.05	3.05	3.05	...
Petroleum, bbl., Pa., crude.	1.70	1.70	1.70	1.70	1.70	...
Rapeseed Oil, refined, gal.	1.00	1.00	1.00	1.00	1.00	...
Rubber, Fine Up-River, Para, lb.	.82	.82	.84	.86	.86	+ .04
Rubber, Ceylon, First Latex, lb.	.85	.87	.89	.89	.92½	+ .07½
Sulphuric Acid, 60 Baume, gal.	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	57.00	55.00	55.00	54.50	54.50	—2.50
Tire Scrap, lb.	.06½	.06½	.06½	.06½	.06½	...

cent on common and 1½ per cent on preferred, payable March 1 to holders of record Feb. 20.

Torbensen Axle Co., 10 per cent on common, and quarterly of 1½ per cent on preferred.

Linde Air Products Co., quarterly of 1½ per cent on preferred, payable April 2 to holders of March 20, and 2 per cent on common, payable March 21, to holders of March 20. Common holders will be offered additional common stock at par to extent of 30 per cent of holdings as of the close of business March 5, payable one-half on or before March 15, and balance on or before June 15. Common stock increased from \$8,000,000 to \$15,000,000. Retiring directors and officers reelected.

Youngstown Sheet & Tube Co., quarterly of 1½ per cent on preferred, payable April 1 to stock of record March 20, and quarterly of \$2 a share and an extra quarterly of \$3 a share, on common, payable April 1 to stock of record March 20. Proposed 100 per cent stock dividend rejected.

White Taxed on Market Value

CLEVELAND, Feb. 9—The market value of a corporation's stock is the proper basis for tax assessment, according to the Ohio State tax commission decision with regard to the White Motor Car Co. The decision followed an objection on the part of the company to having its valuation boosted from \$3,167,000 to \$14,000,000 by county auditor, John A. Zangle. The case, it is reported, will be appealed to the Ohio courts.

Prices of Securities Lower

Trend of Market Downward on Account of Pending Political Action

NEW YORK, Feb. 13—This week's automobile security prices were governed wholly by the developments of the German submarine policy and the relations between that country and the United States. The trend of the market was downward on account of the holiday, there being very little activity. Prices in general on all the industrials which have shown strength during certain vicissitudes were from a fraction to 15 points lower. On the other hand certain of the automobile and accessory issues showed renewed strength by chalking up substantial gains of from 1 to 27 points.

Fisk second preferred rose to 95 at a gain of 15 points; Maxwell first preferred rose 1½ points to 66½, Stewart-Warner common rose 4 points to 85½, and Studebaker jumped to 107, a rise of 27 points.

Tire issues were on the average lower, with little activity.

Saginaw Malleable Iron Co. Incorporated

SAGINAW, MICH., Feb. 10—The Saginaw Malleable Iron Co. has received its incorporation papers. The officers elected were: C. F. Droseski, president; W. J. Wickes, vice-president; J. Kirby,

secretary, G. H. Hannum, treasurer. Directors include: W. J. Wickes, J. J. Kerns, C. T. Kerry, H. T. Robinson and C. F. Droseski of this city, and E. J. Lobdell of the American Wood Rim Co. of Onway.

Over-subscription of the stock of the company necessitated an increase in capitalization from \$350,000 to \$400,000. The company now has a capitalization of \$250,000 common stock and \$150,000 preferred stock.

May List Pierce-Arrow Stock

NEW YORK, Feb. 9—It is expected that application will soon be made to list the securities of the Pierce-Arrow Motor Car Co. on the New York Stock Exchange. There are 100,000 shares of 8 per cent cumulative preferred stock, par value 100, and 250,000 shares of common without par value.

Detroit Corporations Are Consolidated

DETROIT, Feb. 12—The plans for the consolidation of the Detroit Valve & Fittings Co. and the Detroit Brass Works, as reported in a previous issue of THE AUTOMOBILE, were given complete approval by stockholders in a special meeting held Feb. 10. The merger is to be consummated at once.

Allen Joins Republic Motor Truck

DETROIT, Feb. 9—Gould Allen has been appointed to the sales staff of the Republic Motor Truck Co., Alma, Mich. He was formerly sales manager of the Colvert Gear Co., Lockport, N. Y.

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
Ajax Rubber Co.	69	71	— ½
J. I. Case T. M. Co. pfd.	82	85	—1
Chalmers Motor Co. com.	25	30	—5
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Car Co.	95½	97	—3
Chevrolet Motor Co.	95	100	—3
Fisher Body Corp. com.	35	40	—2
Fisher Body Corp. pfd.	90	95	—3
Fisk Rubber Co. com.	60	80	—15
Fisk Rubber Co. 1st pfd.	101	105	—3
Fisk Rubber Co. 2nd pfd.	95	102	+15
Firestone Tire & Rubber Co. com.	140	144	..
Firestone Tire & Rubber Co. pfd.	108	109	..
*General Motors Co. com.	104½	106	—2
*General Motors Co. pfd.	88	89	..
*B. F. Goodrich Co. com.	55	55½	+ ½
*B. F. Goodrich Co. pfd.	109½	110½	..
Goodyear Tire & Rubber Co. com.	270	275	..
Goodyear Tire & Rubber Co. pfd.	107	108	..
Grant Motor Car Corp.	6	8	..
Hupp Motor Car Corp. com.	4	5	..
Hupp Motor Car Corp. pfd.	15	19	—1
International Motor Co. com.	..	70	..
International Motor Co. 1st pfd.	20	30	—5
*Kelly-Springfield Tire Co. com.	51	53	—2
*Kelly-Springfield Tire Co. 1st pfd.	88	95	—2
Lee Rubber & Tire Corp.	20½	22	—2
*Maxwell Motor Co. com.	51	52	..
*Maxwell Motor Co. 1st pfd.	66½	66½	+1½
*Maxwell Motor Co. 2nd pfd.	34	35	..
Miller Rubber Co. com.	245	253	—7
Miller Rubber Co. pfd.	105½	106½	..
Packard Motor Car Co. com.	..	154	..
Packard Motor Car Co. pfd.	..	102	..
Paige-Detroit Motor Car Co.	38	39	..
Peerless Truck & Motor Corp.	16	18	..
Portage Rubber Co. com.	162	167	—4
Portage Rubber Co. pfd.	27	35	..
Regal Motor Car Co. pfd.	..	..	..
Reo Motor Truck Co.	34½	35	..
Reo Motor Car Co.	47	48½	..
Saxon Motor Car Corp.	70	80	..

*At close Feb. 10, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	ACTIVE STOCKS		
	Bid	Asked	Net Ch'ge
Auto Body Co.	..	33½	..
Chalmers Motor Co. com.	..	..	..
Continental Motor Co. com.	9½	10½	+1½
Continental Motor Co. pfd.	98	99	+ ½
Ford Motor Co. of Canada	240	253	..
General Motors Co. com.	..	..	..
Maxwell Motor Co. com.	49	52	..
Maxwell Motor Co. 1st pfd.	..	..	..
Packard Motor Car Co. com.	148	150	..
Packard Motor Car Co. pfd.	..	101½	..
Paige-Detroit Motor Car Co.	37½	39½	..
W. K. Prudden Co.	..	49	..
Reo Motor Car Co.	35½	36½	— ½
Studebaker Corp. com.	100½	104	+1½
Studebaker Corp. pfd.	..	..	..
C. M. Hall Lamp Co.	..	33	..
	INACTIVE STOCKS		
Atlas Drop Forge Co.	..	41	..
Kelsey Wheel Co.	54	59	+9
Regal Motor Car Co. pfd.	27	33	..

Few Closed Cars at Indianapolis

New Quarters Benefit Show—
City a Shipping Center—
Bank Clearings Gain

INDIANAPOLIS, Feb. 13—Indianapolis saw forty-five passenger car exhibits, forty-four accessory exhibits, eighteen truck and two tractor exhibits at the show which closed Saturday night. There were seventy-five touring cars, forty-nine roadsters, forty-one closed cars, twenty-seven trucks and two tractors on view.

Indianapolis has unusual trade facilities. It is the center of population of the states and America's largest city not located on navigable water. Coal is cheap, close at hand and abundant. The Indiana coal fields, within a few miles of the city, are fifth in the total quantity mined. Shipping facilities are the best in the country. Indianapolis is the center of a spider web of railroads placing it within easy reach of all parts of Indiana, Michigan, Ohio, Kentucky and Illinois. Seventeen steam carriers and thirteen electric carriers center here, the latter making it the largest interurban center in the world. Close to a rich agricultural district, possessing raw material, power, labor, market and shipping facilities, Indianapolis possesses the five factors of industrial success.

A Steady Growth

This has resulted in a steady and healthy growth. In 1914 the population was 275,255; in 1915, 282,877; in 1916, 291,940, and it is estimated that 1917 will bring over 300,000. Bank clearings measure a marked increase in the business transacted in the city. The total for last week of \$11,057,886 was approximately 30 per cent more than that of the corresponding week last year. Postal receipts were about \$200 a day larger than at this time a year ago. A marked increase in building permits is noted.

Indiana claims to be the pioneer state in automobile manufacturing, and the second in production to-day. Ten car manufacturers are located in Indianapolis alone—the Cole, National, Pathfinder, Premier, Stutz, Marmon, Empire, Colonial, Hassler and Ford assembly plant. Thirteen other car manufacturers are located elsewhere in the state. The production from Indianapolis for 1916 was 34,762 cars, of which 16,162 were assembled Fords. It is estimated that 60,000 cars will be sent from Indianapolis during the coming year.

Because of the excellent shipping and manufacturing facilities, Indianapolis is a jobbing city. Many nationally-known

accessory and parts manufacturers are located here. Among them are the Prest-O-Lite Co., the Parry Mfg. Co., the Wheeler-Schebler Co., the Hassler Motor Co., Wiedley Motors, the Butler Mfg. Co., and many others.

In 1914 26,500 cars were sold; in 1915, 30,415 cars; in 1916, 43,139 cars, and it is estimated that 60,000 cars will be purchased in the Indiana territory in the coming year.

Indiana has good roads. Of course the business slackens up in the winter, but the problem of Illinois and the mud belt states is missing. A good roads bill is now in the Indiana Senate, proposing that the net proceeds from automobile licenses be turned over to the fund for road construction. This amount is estimated to be from \$700,000 to \$1,000,000, and may be used to build up to 2000 miles of roads each year up to 1920. The action on this bill is doubtful, as it is meeting with some opposition from the counties.

Champion Motors to Open Chicago Branch

DETROIT, Feb. 9—Champion Motors Co. will open a factory branch in Chicago in the very near future.

Detroit Team Will Enter Reliability Run

DETROIT, Feb. 12—Directors of Detroit Automobile Club will place a team in the inter-city Reliability Club run at Buffalo in July. The directors of the Detroit Athletic Club will consider the matter at their next meeting. If both clubs send teams, Detroit will be represented by ten cars. The reliability feature will cover 3 days, starting each morning from Buffalo and returning each evening. Chicago, New York, Indianapolis, Cleveland, and Buffalo are scheduled to send teams.

Safety Rail for Philadelphia Speedway

PHILADELPHIA, Feb. 13—The Philadelphia Motor Speedway Assn. will build a safety rail on the outside of its speedway to prevent runaway racers from plunging off the higher banked curves. At the upper edge of the racing surface will be a rail; beyond the rail is a broad pathway, and at the outer edge of the pathway is another heavy rail surmounted by a screen or fence.

Friendly Receiver for Crowther

ROCHESTER, N. Y., Feb. 13—Friendly involuntary receivership has been entered by the Crowther Motor Co., this city, manufacturer for the Crowther-Duryea roller-driven chassis for business and passenger purposes. It is said that the concern is solvent, but that it needs \$1,000,000 to do business on a sound basis.

York Rich Field for Car Sales

City Has 300 Industrial Plants
—Surrounded by Corn and Tobacco Belt

YORK, PA., Feb. 10—With the present industrial boom and prosperity of this great farming community car dealers predict 2500 car sales for the coming year, a business which will net them at least \$2,500,000. Wage-earners low down on the financial scale are now purchasing more cars than ever. However, the majority of these are low-priced cars. Increased wages to employees of industrial plants is given as the cause for this additional business. The estimated population of York county is 150,000 and, taking the number of cars registered, this would show that there is at least one automobile for at least every thirty persons.

York's influence as an industrial center, has been of vast importance to the automobile dealer. More than 300 industrial plants are located here, their products in 1916 amounting to more than \$25,000,000. This is an increase of more than \$4,000,000 for the past 2 years. The capital invested has increased from \$29,328,000 in 1914 to \$33,596,000 in 1916.

Deposits of the forty-two banking institutions of York city and York county showed a gain of \$3,213,850 for the year, the total deposits aggregating \$26,736,427. Business so extensive as to exceed capacity of industrial establishments, profits boosted by war and the resulting wage increases and bonuses are reflected in the bounding profits. These in 1915 were 23,522,577, the largest recorded until that time. The bank clearings last year amounted to \$53,801,514 as compared with \$47,851,799 for 1915, a difference of \$5,949,716.

Crop conditions in general have probably never been better in this county. The corn crop was second in yield in the State and amounted to 4,715,820 bu., the largest ever grown in the county. The average yield was 65 bu. to the acre. The tobacco crop was also the largest ever grown in the county and was estimated at 7,500,000 lb. This has put much money in the farmers' pockets, as the price of tobacco has advanced as high as 20 cents a pound, where heretofore he received from 8 to 12 cents a pound. The production of wheat in this territory was above the general average, the crop yielding a little more than 19 bu. an acre.

Goodyear Co. Makes Appointments

AKRON, Feb. 13—The Goodyear Tire & Rubber Co. has made several new appointments as follows:

C. W. Martin, Jr., takes charge of the

Southern district, with headquarters at Atlanta, Ga., after serving 5 years as manager of the motor truck tire department. R. S. Wilson, who has been in charge of the service department, has assumed the duties of manager of the motor truck tire department.

G. E. Brunner, who has been assistant to Mr. Wilson in the service department, has been advanced to the position of manager of the department.

W. R. Bliss, formerly manager of the company's Boston branch, is now manager of the New York district. D. M. Colwell, who has been manager of the Southern district, becomes assistant manager of the New York district.

B. S. Waterman, assistant manager of the New England district, assumes the management of the Boston branch, and will continue to look after the company's manufacturers' business in the New England district.

Hare Heads New York Dealers

NEW YORK, Feb. 9—Fifty dealers attended the annual meeting and dinner of the Automobile Dealers Assn., Inc., held in the Oak Room of the Hotel Martinique last night. The following directors were elected to serve one year: E. S. Hare, Packard; C. M. Brown, Winton; H. H. Stratton, Dodge; Wm. C. Poertner, National; R. H. Johnston, White; S. DeB. Keim, Locomobile; William Parkinson, Stutz; F. J. Carrie, Marmon; W. T. Savoy, Autocar; John F. Plummer, Liberty.

Packard Promotes Citizens Only

DETROIT, Feb. 9—Packard Motor Car Corp. has reissued to its employees a statement of the Americans First policy founded a year ago. This provides for the promotion of citizens only. Foreigners will be welcome at the factory but will be expected to qualify for citizenship eventually.

Maxfer Dealers Total 598

CHICAGO, Feb. 10—The Maxfer Truck & Tractor Co., this city, held its first annual banquet of its salesmen and executives during the local show. There was turned in at this banquet \$963,000 from the New York show and \$983,000 from the Chicago show for this year's business.

Dealers have increased 496 since last October, making a total to Feb. 1 of 598

Boston Bank in Buenos Aires

BOSTON, Feb. 12—The First National Bank of Boston has established an Argentine branch in Buenos Aires, under the management of Noel F. Tribe, who has resided in that country for 20 years. The branch is intended for the use of American interests in South America and the promotion of Latin-American trade.

Delaware Boomed By War Profits

Fruit, Textile and Leather Production Also Contributes to State's Wealth

WILMINGTON, Feb. 10—Naturally a rich State, Delaware is richer than ever this year. With its 200,000 people it is said to contribute more than Maryland or the District of Columbia in income taxes.

Delaware has been wonderfully prosperous for the past 2 years. The Du Pont munition works in Wilmington employ 20,000 persons, pay exceptionally high wages and a big bonus besides. There are also seventeen leather factories in the city which are doing the best business in their history, some being among the largest in the world; there are two shipbuilding industries here, one under Charles M. Schwab's control, turning out steel ships, and steel cars, etc., also some of the largest textile mills in the world, while this city is one of the centres of the fiber industry. Upward of \$100,000,000 in capital is invested in 280 establishments in Wilmington manufacturing 400 lines of goods.

The manufactured products last year were about \$71,000,000. Last year the wages paid aggregated \$20,000,000, \$2,000,000 more than during the preceding year. The bank clearings in Wilmington last year amounted to \$156,985,973.06, as compared with \$107,730,062 during 1915.

The population of Wilmington last year, according to a police census, was 106,374, as compared with 87,411, according to the government census of 1910. Permits for building operations valued at \$2,788,028.06, were issued in Wilmington last year and for 1915 the aggregate was \$1,524,852.05. Last year there were only 58 business failures on the peninsula, with liabilities of \$485,708.33, as compared with 83 failures during the preceding year and liabilities of \$1,178,532.86.

The good fortune has by no means been confined to the city, for, according to the Delaware State Board of Agriculture, the crops raised in the State last year were valued at \$13,101,200, as compared with \$9,157,680 in the year 1915. The volume last year was not quite as great as in the year before, but the prices were better. Delaware's chief agricultural industry now centers largely in berries, fruit, products for canning and market gardening and dairy products. Last year New Castle county, in which Wilmington is located, raised crops valued at \$3,250,000, as compared with \$3,000,000 the year before, according to Prof. Harry Hayward, who is in charge of the agricultural department of Delaware College. Surveys made during the year by the

college, in co-operation with the federal government, showed that in New Castle county the money invested in agriculture earned from 5 to 9 per cent, according to crops and conditions; in Kent and Sussex counties, Delaware, 7 to 9 per cent in the heavy berry sections, with a general average in those two counties of 5 to 6 per cent; the average on the whole peninsula being estimated at 6 per cent. Incidentally, the number of farmers who have bought motor cars was greater last year than ever before. While many are buying cars for pleasure, a large number find them a convenience and economical in their business. This trade is capable of large development. The farmer, however, is not the only new customer for the motor car dealer, for many of the small merchants and even some mechanics in the city are now owning cars.

Last year approximately 2500 were sold in Delaware, the registration, 7102, showing an increase of 2445 over the preceding year. This year's sales are expected to be somewhere between 3500 and 4000. In Delaware there are 412 dealers, about 350 garages and 275 repair shops.

Automobile Mechanics Corp. Buys Two Companies

NEW YORK, Feb. 12—The Automobile Mechanics Corp. has bought the Abbott-Detroit Parts Corp. and the Marion Auto Service Co. It has also acquired the Elcar service for the eastern part of the United States and a large stock of Pullman parts for the Pullman service. The company, which does extensive repair work, has taken new quarters at 221 West Fifty-third Street, New York.

Sales Agents for Hayes Wheels

DETROIT, Feb. 12—F. E. Castle and H. W. Kyte have completed a transaction with the Hayes Wheel Co., Jackson, Mich., to become the general sales agents for wire wheels which this company will begin to manufacture. Mr. Kyte was formerly the manager of the Houk Manufacturing Co., and Mr. Castle has been connected with the automobile accessory industry for the past 16 years.

Harroun Signs Up Distributors

DETROIT, Feb. 12—Harroun Motors Co. has signed up a number of big distributors in the past few weeks. Among these are: Mark-Roberts Motor Co., Seattle, Portland and Spokane; Lord Motor Car Co., Lincoln, Neb.; Southern Motors Corp., El Paso; Buxton-Phillips Motor Car Corp., Kansas City; Wetmore & Quinn, Detroit, and others.

Chalmers Has \$8,000,000 Material

DETROIT, Feb. 12—The Chalmers Motor Co. has \$8,000,000 worth of material on hand.



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The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Aero Show

IT is not easy to reckon up the value of an exhibition like the aero show, because at present there are but few customers. The exhibition held this week in New York is composed of aeroplane builders and people who supply aeroplane builders with the things they need, but it is a much more important event than a mere get-together of the members of the youngest industry.

It is essential for a new industry to attract attention. It has got to popularize itself; it has got to stimulate public imagination. Every industry depends for its success upon the men who are in it. It requires brains of all kinds and it is best served when it secures those brains young and vigorous. We do not know what will be the ultimate volume of aeroplane manufacture; we do not know how it will rank as an industry in the years to come, but we do know, and this it is certain, that it will be much larger and vastly more important than it is to-day. Although its main usefulness has so far been in war, the aeroplane is something far more than a weapon, and its commercial value will develop from its military value.

The aero show stimulated thought among thousands of people who previously had never even seen a flying machine. There have been no great crowds, but the attendance has been good and the really deep interest of the most careless amongst the sight-seers was very noticeable.

Elevated Automobile Streets

CITIES such as New York, Chicago, Boston, and a few others will soon be face to face with the necessity of taking radical measures to relieve vehicular congestion. Already subways for automobiles have been suggested, the *New York Times* advocating such a system. *THE AUTOMOBILE* for several months has favored an elevated automobile road in New York for passenger car traffic. Such a roadway would extend from the lower end of the city north to Central Park, or perhaps further. With such an elevated system speeds of 40 m.p.h. would be permissible and the business man with offices on Wall Street or in the financial section would reach his office quicker than he can to-day on the subway.

That there is prime necessity for such an elevated automobile road is evidenced by the congested traffic. It is so bad that automobile traffic in many business sections is as slow as walking. The greater usefulness of the automobile is being seriously hampered, and relief can only come through such an elevated system. With the elevated automobile road there would be provision to get onto it at every third or fourth street. The roadway would be divided for two-way traffic and would be controlled by a special traffic force.

Parting From Gravity

FOR us to get rid of the habit of estimating the quality of gasoline by means of its specific gravity or Baumé will be hard. It will take a long time before even the trade ceases to trust in it and still longer before motorists realize its uselessness. Moreover, there is nothing simpler to replace it.

Probably we shall come ultimately to thinking of the starting and end points of the distillation curves, because these two temperatures do give some idea of what the gasoline is, but it is to be hoped that some simpler way of naming these figures may be devised. The starting point, the temperature at which the lightest fraction in the gasoline begins to boil, shows roughly how easy it will be to start on the fuel, and the end point, or the temperature as the last few drops of the heaviest constituent evaporate, shows roughly how easy it is to burn the fuel completely without leaving gummy or carbon deposits in the cylinders. Unfortunately these two figures do not tell the thermal value of the fuel, which is its ability to produce power.

In a rough way the lower the starting point and the lower the end point the "cleaner" is the gasoline. European buyers till quite recently refused to take any gasoline with an end point higher than 300 deg. Fahr.; but many engineers now consider that this sort of gas, while clean enough, is not as good a fuel as one with a 400-deg. end point, and they are not prepared to say that one with a 450 end point will not burn just as well in a modern engine. These things have got to be cleared up, but in reaching a conclusion the need for a simple way of naming the quality determining factors must not be overlooked.

MANUFACTURERS' MERCHANDISING

*Second Article of
The Automobile's
New Department*

*Manufacturer
to Distributor,
Dealer, Buyer*

\$50,000,000 To Be Spent on Aeroplanes Should Tempt Automobile Parts Makers To Get Busy in New Field

THE most successful men and firms in any business are those who saw an opportunity just a little before the rest and were not afraid to trust their own judgment. This is not perhaps so true of the men with revolutionary ideas, but it is invariably true of those who supply the revolutionaries with what they need.

The most successful firms in the automobile business are not the original builders of cars, but a study of the firms supplying the car builders shows that the early birds did most certainly secure the worms. Are we not going to see a repetition of this situation with respect to aircraft manufacture?

Needs of Aviation Industry

The *design* of an aeroplane is an entirely special business. It is not a thing to be embarked upon by any automobile manufacturer unless as a separate venture entirely unconnected with his existing business, but this is no reason why firms equipped for the supply of parts to automobile manufacturers should not add to their production articles which go to the construction of an aeroplane.

In the case of engines, the automobile industry is already firmly established, since if many of the complete motors are made by concerns having no automobile connection, still the valves, valve springs, castings, forgings, spark plugs, carbureters, etc., all come from automobile sources. These things differ but very little from what is required in the making of automobiles, but they do differ. So, when one turns to parts of planes themselves, it is a little surprising to find so many strange names among the makers of the innumerable small fittings which are a part of every machine.

Field for Stampings

To cite just a single example, in every aeroplane there are a great many parts made from sheet metal. Usually these are cut out by hand and formed by hand, each aeroplane manufacturer producing his own. They could be made on a production scale by stamping, not only far more economically but far better, yet how many of the automobile stamping firms are making any real effort to get the aeroplane builders' business?

Following this item just a stage further, it may be argued that the total quantity required is in any case small; that the permanency of the aeroplane business is still debatable; that there is so great a demand from the automobile manufacturers that it is not

worth while considering new and troublesome business. It is difficult to believe that any of these arguments are really sound.

The manufacturer or builder of aeroplanes is not for long going to be content to do unnecessary work for himself. The making of the necessary woodwork, assembling, covering the wings, etc., is quite sufficient a business in itself. It needs a class of labor totally distinct from that required for the manufacture of metal fittings. The former is the essential feature of aeroplane making, the latter is the non-essential feature.

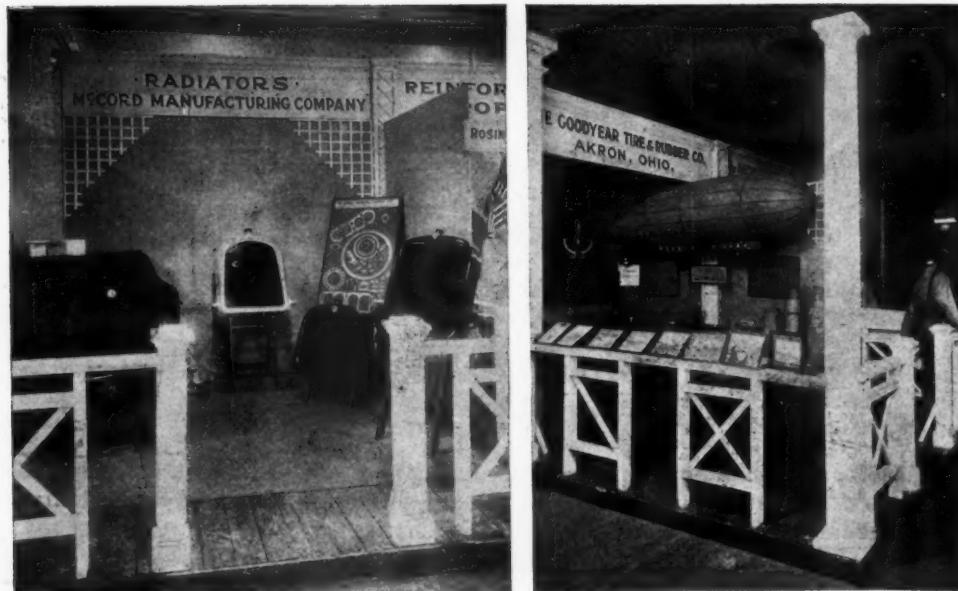
With respect to the bolts used in aeroplane building, the wire strainers, and similar automatic machine tool produced parts, standardization permitting economical quantity manufacture is coming rapidly. There is no reason why a certain amount of standardization in sheet metal parts is not followed, but both forms of standardizing will come much quicker if aided by the powerful influence which well-established manufacturers of such specialties can bring to bear. At present, when the aeroplane builder has come to the automobile supply house he has usually been welcome.

Magneto Industry Active

Take the case of the magneto industry, and we see this entirely in the hands of firms famous in the automobile world. The Splitdorf Co., for example, has had an engineer who for the past year or more has spent the whole of his time following up the Splitdorf magnetos in air service, tracking down any failure, discovering any shortcoming, investigating all possibilities for future improvement. No doubt the same is true also of other magneto concerns as it is true of the leading spark-plug makers and of the most up-to-date carburetor manufacturers.

On the other hand, the case of the radiators is different; the radiator is as essential a part of a water-cooled power plant as the magneto; being merely dead weight its efficiency is of high importance. Upon it falls the task of removing the heat as rapidly as possible with as little water as possible. Nobody is better equipped for supplying the aeroplane with the radiators it needs than the automobile radiator manufacturers. Yet it is obvious they have not taken a grip, and if ultimately they want to hold their proper place every week's delay is going to increase the difficulty of getting that grip.

Aeroplanes are going to carry a good deal of electrical equipment. Their engines obviously will be

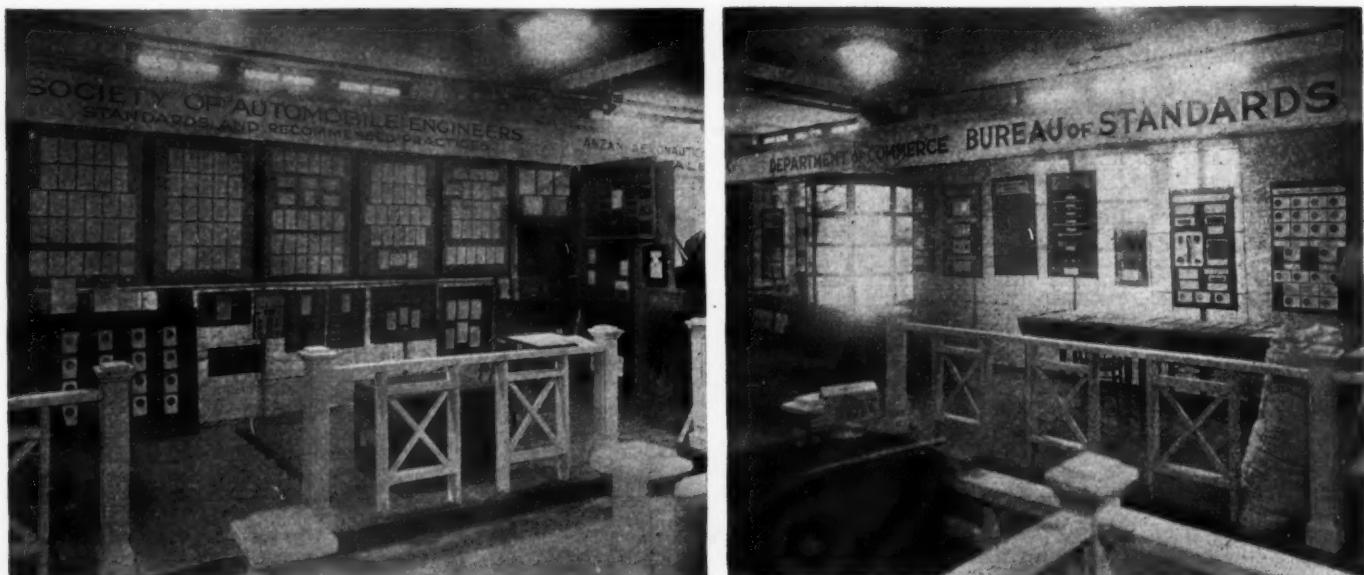


McCord is prepared to make aeroplane radiators and Goodyear already has a large business with fabrics for aircraft

Examples
of
Aero Show
Exhibits



There is no plane without some aluminum castings and Stromberg is paying close attention to aviation engine carburetion



A booth was devoted to display of S. A. E. standards and the adjoining one to samples of testing work by the Bureau of Standards

started electrically. Electricity will probably be used in some way in connection with controls. It is needed on military machines for radio apparatus. For the manufacture of compact light-weight electrical fittings, no one can compete with the automobile specialists, if they will only take the trouble to bring their experience to bear upon the very few additional problems which appear in designing for aircraft, and just a few have realized this. It is a field that will pay in the future.

Missing Opportunity

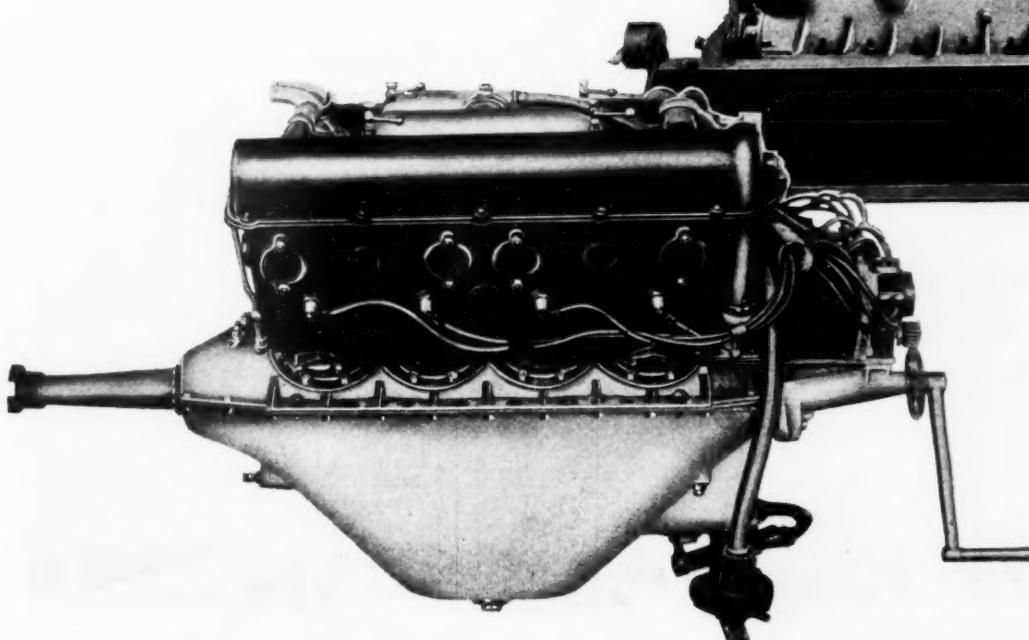
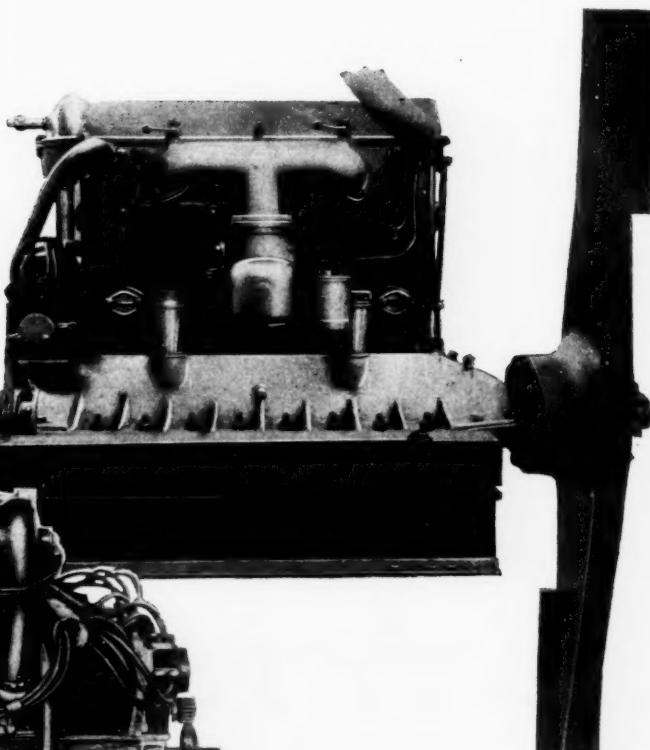
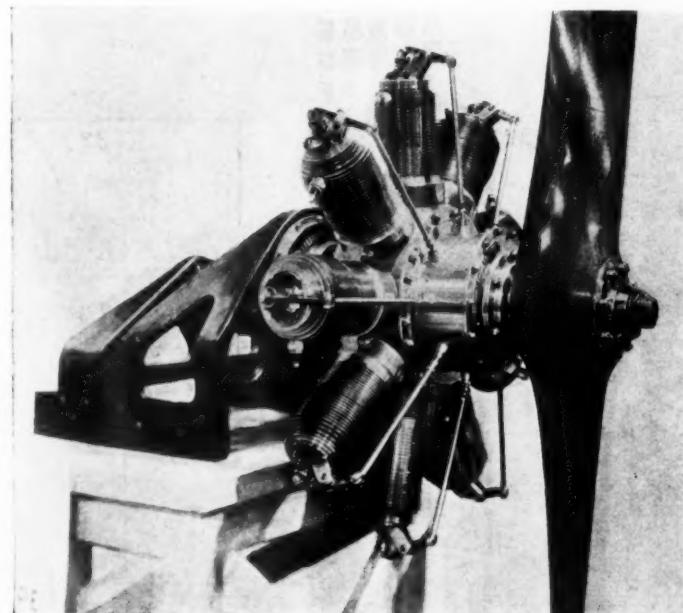
The First National Aero Exhibition in New York shows that the automobile parts manufacturers have not yet realized the opportunities in the new field. Only a few of them are ready to go ahead after some of the \$50,000,000 which the United States Government will spend on aircraft this year, to say nothing

of the large sums which foreign governments are spending in this country.

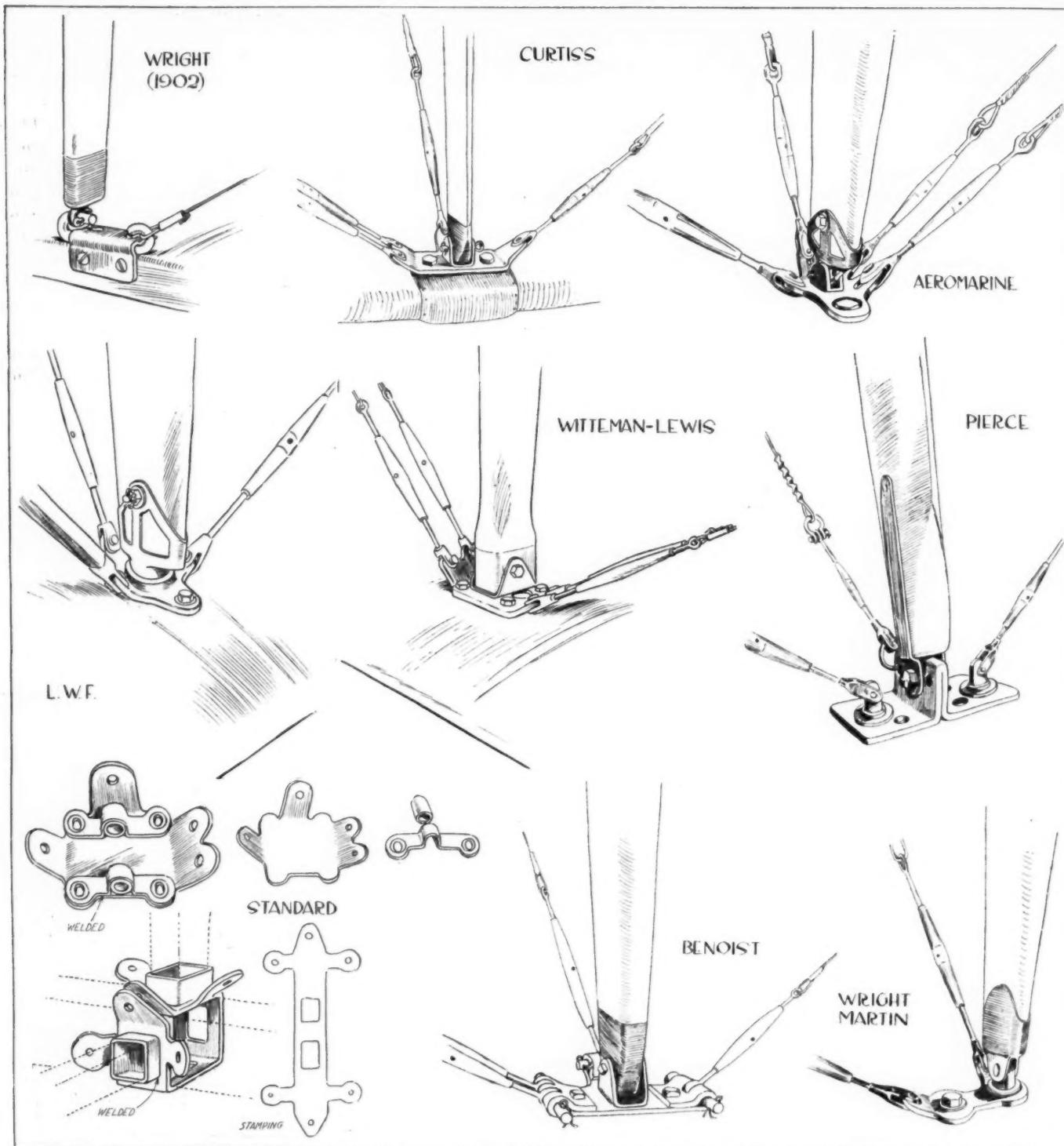
The aeroplane builder who wants something made for him has now got to seek out somebody to make it. He is not yet receiving many inquiries from parts manufacturers asking what they could make for him. To wait for the customer to come to you is a common fault with large firms, more especially when the new customer looks pretty small. The export trade of the United States has lost incredible sums of money through its apathy with respect to the South American markets. The reason was no doubt that nobody felt very sure what sort of a fellow the South American buyer really was. Our more progressive firms have got busy and found out, and it is high time that our automobile parts specialists got busy and found out about the consuming power of the aeroplane industry.

Two Famous Engines

THE Gnome rotating engine exhibited by the General Vehicle Co. at the aero show, and the four and six cylinder Hispano-Suiza engines in the Wright-Martin booth are both being made for foreign governments and the details regarding them which are at present available are somewhat meager. The Gnome seems to be precisely the same as it was several years ago, the cylinders still being turned from the solid billet and the crankcase made from two drop forgings.

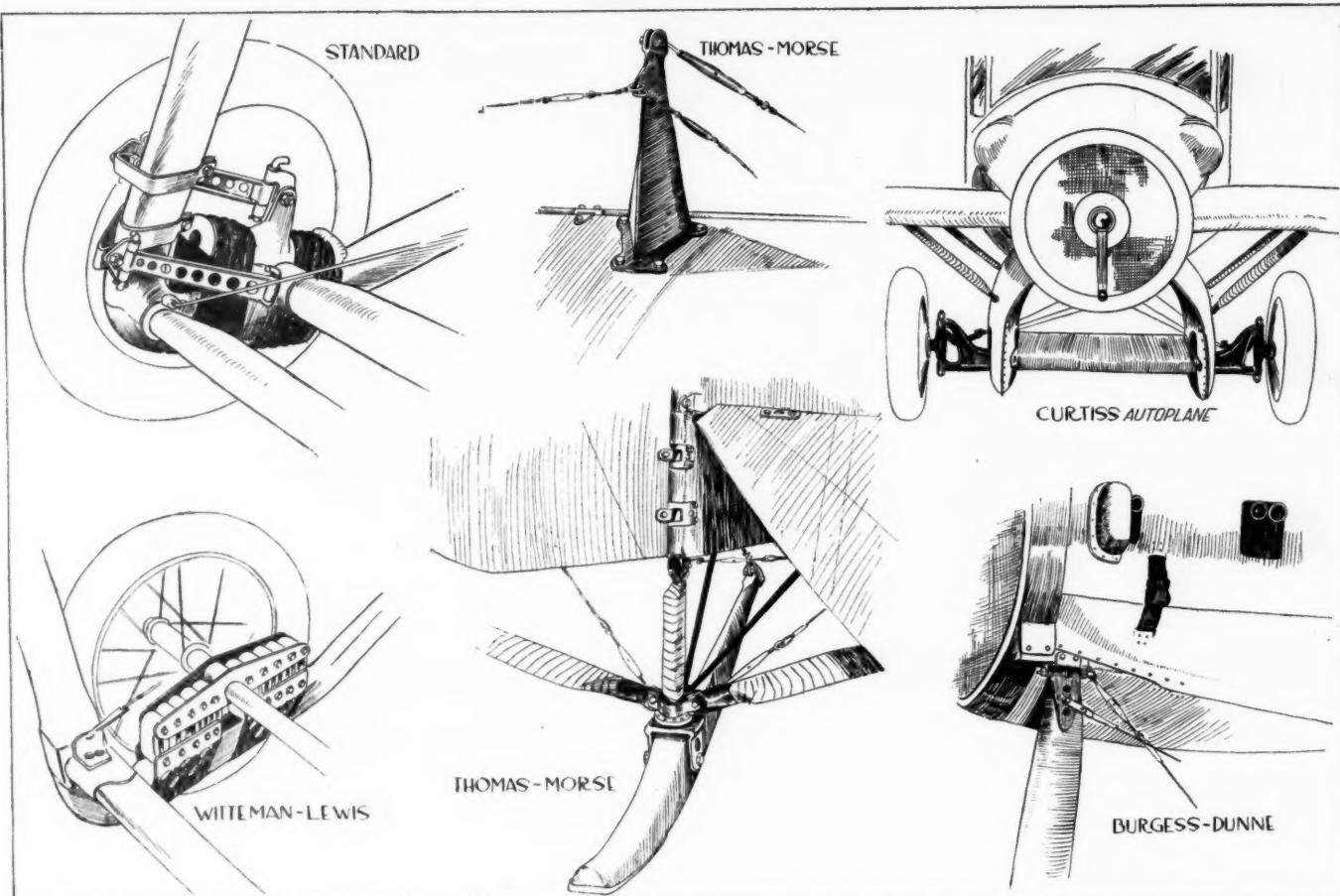


The Hispano motor is an aluminum cylinder job, the eight being apparently two fours so far as the cylinders are concerned. The overhead camshafts operate directly upon the ends of the valves which are provided with adjustable end pieces that act as the tappets.



Aeroplane Show Statistics and Details

Engine	Hp.	B. & S.	R.P.M.	Cylinders	Number Carburetors	Number Magnetos	Valves	Propeller Speed	Material of Pistons
Duesenberg	400	4 1/8 x 7	2100	12 V	2	2	Horizontal	Direct	Aluminum alloy
Duesenberg	70	4 3/8 x 7	1500	4 vertical	1	1	16	Direct	Aluminum alloy
Packard	225	4 x 6	2180	12 V	2	1	I-head	1250	Aluminum alloy
Trebert	150	4 x 4	1500	16 revolving	1	2	F-head	Direct	Magnalite
Frederickson	70	4 1/2 x 4 3/4	1000	5 revolving	.....	1	Two-cycle	Direct	Cast iron
Wisconsin	150	5 x 6 1/2	1500	6 vertical	1	2	I-head	Direct	Aluminum alloy
Wisconsin	300	5 x 6 1/2	1500	12 V	4	2	I-head	Direct	Aluminum alloy
Gnome	100	4 x 6	1200	9 revolving	.....	1	I-head	Direct	Steel
Knox	300	4 3/4 x 7	1800	12 V	2	.....	I-head	1080	Aluminum alloy
Anzain	220	4 x 5	1200	20 circular	2	2	I-head	Direct	.....
Roberts	105	5 x 5 1/2	1300	6 vertical	2	2	.....	Direct	Cast iron
Thomas-Morse	135	4 x 5 1/2	1200	8 V	1	2	L-Head	Direct	.....



Engine	Hp.	B. & S.	R.P.M.	Cylinders	Number Carburetors	Number Magneto	Valves	Propeller Speed	Material in Pistons
Aeromarine	100	3 1/2 x 5 1/8	2300	8 V	1	.....	I-head	1150	Aluminum
Curtiss	90	4 x 4	1400	8 V	1	1	I-head	.....	Aluminum
Curtiss	100	4 1/4 x 5	1400	8 V	1	2	I-head	.....	Aluminum
Curtiss	200	5 x 7	1400	9 V	2	2	I-head	.....	Aluminum
Curtiss	300	5 x 7	1400	12 V	2	2	I-head	.....	Aluminum
Wright-Martin	150	4.72 x 5.1	1450	8 V	1	2	I-head	Direct	.....
Wright-Martin	75	.....	.....	4 vertical	1	2	I-head	.....	.....
Hall-Scott	150	.....	1375	6 vertical	.....	.....	I-head	Direct	.....
Sturtevant	140	4 x 5 1/2	2000	8 V	1	1	I-head	Direct	Aluminum
Pierce	35	4 x 6	.....	3 radial	.....	.....	I-head	.....	Aluminum

Plane	Type	Wing Span		Chord	Gap	Carry-ing Capa-city	Lifting Capa-city	Propeller	Control	Price	Motor	Miscellaneous
		Upper	Lower									
Benoist	Bi-flying boat	46'	46'	5'	6'	2200	550	1 pusher	Dep.	\$6,500	Roberts 100 hp. in planes	2 radiators, 1 each side of motor
Thomas-Morse	Military tractor biplane	52'9"	34'	5'3"	5'	2150	700	1 tractor	Dep.	....	135 hp.	.....
Cooper	Bi-flying boat	33'	22'	...	4'6"	...	...	1 pusher	...	4,000	70 hp.	Flexible wings Flexible control surface
Aeromarine	Biplane	41'	31'	...	...	1900	700	1 tractor	Dep.	9,000	100 hp.	.....
Curtiss	Military tractor	43'6"	34'	5'	5'2"	1890	485	1 tractor	Dep.	....	90 hp.	.....
Curtiss	Bi-flying boat	45'2"	35'2"	5'2"	5'11"	2100	660	1 pusher	Dep.	....	100 hp.	Curtiss
Curtiss	Triplane boat	40'	40'	...	...	2450	1450	.....	Dep.	....	100 hp.	.....
Burgess-Dunne	Bi-seaplane	46'	46'	5'	5'3"	2400	900	1 tractor	Dep.	....	Roberts 100 hp.	.....
Wright-Martin	Bi-military tractor	29'	29'	5'8"	5'9 1/2"	1725	915	1 tractor	Dep.	....	150 hp.	Hispano-Suiza
Wright-Martin	Bi-tractor	50'7"	50'7"	...	...	1905	983	1 tractor	Dep.	....	150 hp.	Hall-Scott
Pierce	Biplane	26'	20'	5'6"	5'6"	880	250	1 tractor	Dep.	3,000	35 hp.	.....
Witteman	Bi-military tractor	42'	42'	5'6"	5'6"	1375	600	1 tractor	Dep.	....	90 hp.	Hall-Scott

90,000 Cars for Northwest in 1917

Minneapolis, Distributing Center of Great Agricultural Territory, Doubles Show Over 1916—216,936 Farmer Prospects—Crops in Four States Worth \$555,572,000

MINNEAPOLIS, Feb. 10—Sales of 90,000 cars in the great dairy and agricultural territory served by Minneapolis are predicted for 1917 by branch managers and dealers at the annual show. This is an increase of 10,000 over sales in 1916, and, moreover, there are 216,936 farmers in this territory who are prospective car owners. Industrial and financial conditions are more propitious than at any time in the history of the section and the crops of the coming year, the index to car sales, are expected to prove very heavy and enormously profitable.

Show Doubled in Size

The Minneapolis show, looked upon as one of the most important in the country from a sales standpoint, is greatly improved over last year and practically doubled in size. A snowfall of almost unprecedented severity, the heaviest in 40 years, kept thousands of enthusiastic car owners and dealers away from the opening, many towns not having seen a train for 2 weeks, but later a good representation of the 3,000,000 or more population of the territory forced their way to this city, sometimes by dynamiting 15-ft. snowbanks to enable traffic to pass.

Previously Minneapolis shows have been held in the Armory, but this building was found to be too small, and arrangements were made this year to use the Mazda Lamp factory building, recently completed but not put into use on account of a lack of machinery. This building has 119,000 sq. ft. of floor space, whereas the Armory had but 65,000. Three floors and the basement were occupied this year by the show and the exhibits numbered 238 as against 148 a year ago. Exhibitors of passenger cars increased from forty-eight last year to seventy-two this year, and the number of machines exhibited this year is 300, compared with 203 in 1916. Accessory exhibitors to the number of seventy-four displayed their wares this year, compared with forty-eight last year. Thirty-six commercial car exhibits are made this year as against seven in 1916, and there are eight tractor exhibits this year, where there was none a year ago. In connection with the show Minneapolis-made products, ranging from beds to engines, were shown in a room adjoining the

Northwest Statistics

Farmers' Yearly Receipts

Grain	\$555,572,000
Butter	40,000,000
Butter Fat	30,000,000
Live Stock	30,000,000
Poultry	30,000,000

Car Sales Factors

Farmer Prospects	216,936
Estimated 1917 Sales..	90,000
1916 Car Sales	80,000

show, occupying 13,600 sq. ft. of floor space.

Comparing the Minneapolis show with those of New York and Chicago, it is found to be only slightly smaller when the number of exhibits are considered, and one has only to study the vast distributing territory into which the Twin Cities distribute automobiles to find the reason for a show of such proportions.

Territory's Wealth Enormous

Without being specific as to the richness of the states tributary to Minneapolis, the extent of which is difficult to grasp unless one drives over the prairie, the crop reports give a fairly good idea of the buying possibilities found in the rural residents of this vast territory of the Northwest. Among the leading industries of the Minneapolis trade territory are farming, dairying, wool-growing, live-stock raising, manufacturing and iron mining. Every one of these is active. Wages paid laboring men have advanced materially since a year ago, particularly in mining and manufacturing. Estimates of wages paid in the Butte and Anaconda districts of Montana, alone, are placed at \$3,500,000 a month, and all of this money is put into circulation, due to the high prices of living necessities.

The wealth of the Great Northwest this year, while perhaps not as great as last year, is staggering. Creameries pay farmers about \$30,000,000 a year for butter fat, while butter adds \$40,000,000 more. Receipts for live stock give

farmers approximately \$30,000,000 a year and the poultry division was estimated to pay \$30,000,000 a year also. Estimates give the combined dairy and live stock receipts of Minnesota and the Dakotas as \$200,000,000 a year and estimates of cash available from all sources last year put the figure at \$684,000,000, to which might be added the estimate by the Montana agriculture commissioner of \$94,936,000 as the crop value of 1916 for that state. In these four principal states the total crop of wheat, corn, oats, barley, rye and flax last year amounted to 963,561,000 bu. by government estimate valued at \$555,572,000.

Figures for the fiscal year ended Dec. 31, 1916, and showing comparison between 1915 and 1916 crops in Minnesota follow:

	1916 Bushels	1915 Bushels
Wheat	170,208,650	169,981,320
Corn	5,733,680	14,880,260
Oats	49,467,830	21,924,230
Barley	45,852,130	28,538,400
Rye	6,890,650	5,210,190
Flaxseed	7,461,210	7,199,150
Flour shipped	21,300,994	Barrels

Receipts of wheat in Minneapolis are approximately 11,000,000 bu. less for 1916 than 1915 and the total receipts of all grains were 1,000,000 bu. less the year of 1916 than its predecessor. The following table gives the receipts of grain in Minneapolis market as shown by the Chamber of Commerce report:

	1916 Bushels	1915 Bushels
Wheat	131,947,520	142,669,370
Corn	7,137,260	10,777,330
Oats	42,535,710	33,544,650
Barley	37,271,590	36,593,780
Rye	7,202,030	6,236,660
Flaxseed	8,797,460	6,148,970
Total	234,891,570	235,970,760
Flour	900,648	Barrels

The financial condition of this great territory is reflected in the bank reports, and dealers from the various districts of this territory report that the small country banks are bulging with money which the farmers have received for their 1916 crops. Thus the field for the sale of 1917 cars in the territory fed by factory branches and distributing agencies in Minneapolis is especially good. What is more, the people are able to pay for the cars they buy, whereas in previous years it has largely been the policy of farmers to buy cars on time, which neces-

sitated the dealers converting their notes into money at the bank. It is not so long ago that some of the smaller farmers found themselves unable to pay even interest and taxes on their property, but the banner crop years of 1914, 1915 and 1916 have enabled them not only to pay off all taxes and interest charges but to pay for the land as well and leave them a comfortable bank balance.

\$1,800 Farmer's Average

While averages may not be taken as the criterion of what every farmer in this territory earned last year, they offer an interesting study. The census shows approximately 430,000 farmers in the territory handled in Minneapolis, with an approximate total gross income for last year of \$779,000,000, which would give each an average income of slightly over \$1,800. One-half of these farmers now own cars and the other half are prospects this year.

Farms in the Northwest cannot be compared with the farms of Illinois, Indiana and Ohio. The Northwest is a territory of great distances and the automobile is a dominant factor in diminishing distance. It has removed barriers hitherto considered insurmountable and proved a worth-while factor in educational, social and commercial progress.

With the farmers in a position to buy, dealers and distributors have planned a very active campaign for the early spring. The latest car census goes to show that in this particular territory there are at least 216,936 farmers who have not yet become car owners. Conservative estimates made by branch managers and dealers put the number of cars to be sold in this territory in 1917 at 90,000, which is an increase of 10,000 over the number sold last year. The average cost of these 90,000 cars is variously estimated at from \$765 to \$900 each. The first figure would give the valuation of \$70,000,000 in business for the year, while a more liberal estimate would give \$84,000,000. When one is in Minneapolis, making a survey of business conditions, one must think in terms of the soil. Here money and crops are synonymous. Bankers as a unit say that the territory is in a prosperous condition, and, although the crop as a whole did not come up to the figures for the bumper harvest of 1915, the average price is higher, which nearly made up the difference. Money is easy and collections are good.

Looking to the future—specifically 1917 crops—the heavy snows in January and February presage a harvest second to none in the great Northwest since the automobile became a reality. Not in 40 years has there been such a snow in January close to the Twin City, and if this blanket disappears gradually in the spring the great snow overflow of the

Northwest will filter into the soil, creating a deep moisture and causing grain to stull deep as preparedness against possibly dry weather before harvest time.

Before making an analysis of what the 1916 crop or the one to come may mean in the sale of cars, perhaps we can get a better conception of their meaning by considering what crops have already done in the way of increasing cars in the state of Minnesota. It was estimated by J. A. Schmall, secretary of state, that by the end of 1917 car registrations in Minnesota will be 200,000. To-day his books show slightly over 138,000 cars in that state, a figure which he prophesied a year ago. Half a decade ago there were only 17,960 cars in Min-

Minnesota Registration by Makes

Name	1913	1914	1915	1916
Abbott	79	158	154	176
Apperson	75	95	109	155
Auburn	108	117	109	153
Briscoe		10	64	115
Buick	3,710	5,781	6,686	8,716
Cadillac	1,292	1,577	1,597	1,924
Chalmers	618	783	826	1,122
Chandler		120	234	
Chevrolet	6	464	1,284	2,440
Empire	39	149	279	341
Enger	8	6	10	12
Fiat	2	17	25	27
Ford	10,321	19,339	30,708	44,471
Franklin	291	351	354	455
Haynes	93	118	172	236
Hudson	531	722	917	1,219
Hupmobile	544	792	893	1,212
Interstate	90	249	156	217
Jeffery	15	166	440	574
Kissel	457	560	718	873
Locomobile	35	97	116	132
Lozier	56	63	79	90
Marmon	88	95	88	101
Maxwell	1,552	2,260	3,551	4,974
Mercer	8	12	17	23
Metz	237	401	516	654
Mitchell	858	998	983	1,234
Moline	81	104	86	111
Moon	26	22	76	111
National	17	50	71	104
Oakland	430	629	1,075	1,555
Oldsmobile	386	446	505	654
Overland	3,183	4,973	7,518	11,802
Packard	547	645	653	817
Paige	197	403	613	815
Pathfinder	8	26	47	64
Peerless	163	284	267	301
Pierce-Arrow	216	256	240	282
Premier	49	74	61	65
Simplex	5	6	4	8
Stearns	61	59	71	94
Studebaker	1,760	3,001	5,637	7,437
Stutz	5	7	28	36
Velie	465	590	637	778
White	262	282	265	317
Winton	197	231	248	300

nesota. Two years ago there was but 68,500 machines, this number being increased 46,000 last year.

Ford leads in the number of cars now owned in that territory, while Overland is second and still ahead of its nearest competitor, Buick—these two have run a neck-and-neck race a number of years.

License tags in Minnesota are sold for 3 years for \$1.50. The last triennium began in 1915. For the first two years the returns of the state were \$241,000, as compared with \$144,531 for the entire preceding 3-year period. Beginning next year, license tags will cost \$5 for 3 years. This will be pro-rated after Jan. 1, 1919, at \$3.50, and \$2 for 1920. Registrations by years are:

Year	Cars	Year	Cars
1909	7,000	1914	68,500
1910	12,500	1915	94,000
1911	19,000	1916	138,000
1912	28,400	1917 (est.)	200,000
1913	45,800		

Analyzing the 138,000 cars now owned in Minnesota, we find 50,807 are owned in towns of more than 1000 population. In fact this is a greater number than is owned in towns of any other population. The percentage of increase of the number of cars now owned in towns of under 1000 population compared with a year ago is 38.8. These figures indicate that the majority, in fact nearly all, of the cars go direct to farmers. The relative number of cars owned in small towns and in the three larger cities—Minneapolis, St. Paul and Duluth—serves to prove the farmer's case even further. Registration figures of cars owned in these three cities total 30,096 in 1916, which, subtracted from the total registration of 138,000, gives 108,000 owned by farmers and people in towns outside of these three large cities. Outside of these three cities, there are no others in the state in excess of 20,000 population, and in the towns with populations ranging from 10,000 to 20,000 cars only 3277 cars were owned last year. In the class of 9000 to 10,000, the number of cars last year totaled 1154, while those in towns from 2000 to 9000 totaled approximately 15,000 cars. This would leave approximately 90,000 cars owned in towns under 2000 and in the country districts.

High Car-Population Ratio

The Northwest is buying cars faster in ratio to its population than any other district in the country and it is not unusual to find people close in touch with the industry saying that within the next 10 years there will be a car for every ten or twelve people throughout the territory. It must not be thought that Minnesota farmers or in fact farmers of the entire territory that gets its cars from Minneapolis is near the saturation point in car buying. While it is admitted that approximately 50 per cent of farmers in Minnesota, the Dakotas, eastern Montana, northern Iowa and western Wisconsin—the territory embraced in the Minneapolis district—own cars, the other 50 per cent will be buying cars within comparatively a short time, and to-day there is a definite field for the sale of approximately 216,000 new cars in this district, say nothing of the re-orders from present car owners.

The foregoing figures tend to show that farmers are buying cars selling for more than \$1,000 and information gained from dealers and distributors in general at the Minneapolis show was to the effect that the farmers in the Northwest show a greater tendency from year to year to buy cars of the more expensive type, especially those listing above \$1,000.

The Twin Cities made good in the po-

sition they took last year—that of being the biggest distributing territory in the country for many makers of cars. More than ever are manufacturers realizing the importance of this territory. Carload receipts of motor vehicles into Minneapolis last year showed a gain of 25 per cent over 1915, the figures for the two years being 5804 and 4835 respectively, while shipments of complete cars outshone an even greater gain, the number of carloads shipped out of Minneapolis in 1916 being 6930, as against 3837 in 1915.

A census of Minneapolis, showing the origin of much of the automobile and accessory business in the Northwest, places dealers in automobiles at eighty-four; dealers in trucks, twenty-six; dealers in electrics only, five; dealers in accessories, 165; manufacturers of trucks, seven; assembling plants, two; makers of parts and appliances, six; garages, seventy-one, and garages for electrics only, three.

As an indication of what some makers think of this territory as a field of endeavor, the production program of the Ford Motor Co.'s assembly plant is indicative. During the last fiscal year for the Ford branch, which ended July 31, 1916, 25,954 cars were assembled and sold, while the number built since Aug. 1, 1916, totals almost as much as all that were produced during the previous fiscal year, the actual number to date being 22,232. The production program for this year calls for between 50,000 and 60,000 cars. Freight cars are and have been at a premium in the Twin Cities for several months and the situation is more acute just at present than it has been previously. Officials of the traffic bureau estimate that Minneapolis industries in general are not getting more than 10 per cent of their requirements.

The Ford branch received 1760 carloads of parts during the fiscal year ending July 31, 1916, and since that time received 1200 carloads. Outgoing shipments during the last fiscal year were 2981 carloads, and since Aug. 1, 1916, 2353 carloads have been shipped. No cars are stored in Minneapolis at the Ford company and production at present is kept in harmony with the number of freight cars available.

Car Shortage Serious

As an evidence of how car shortage effects industry in Minneapolis the Washburn-Crosby Co., during the last few weeks has averaged 7700 bbl. of flour a day in its plant whereas its capacity is 28,000 bbl. daily. This is the average situation. In few if any of the manufacturing concerns are running over one-third their capacity. Flour to-day in carload lots is selling for \$8.40 a bbl., whereas a year ago it was \$6.35. The highest mark reached in the last few

weeks is \$9.65 a bbl. So urgent has become the demand for freight cars that the Minneapolis Traffic Association has sent a committee to make a plea before the Interstate Commerce Commission for the release of all cars being held in the East at the earliest possible moment. Over 25,000,000 bu. of wheat and millions of bushels of oats, barley, corn and rye are tied up in elevators in Minneapolis. Millions of bushels more lie in cars in the railroad terminals and on sidings in the territory surrounding Minneapolis.

What is true of the grain situation is true in a measure with automobiles. Of course, at present the call for cars for retail sales is not heavy, but the car factories are anxious to move as many machines to points of distribution as possible to avoid storing them at the factory and several manufacturers are now shipping cars from Minneapolis and storing them as rapidly as they can get freight cars to handle shipments.

One big branch manager in Minneapolis who has sold his entire allotment took occasion to classify Montana as one of the best present sales districts in the Northwest, which, according to him, is doubly as good as a year ago. North and South Dakota are not considered as good as in previous years, and the same might be said in Minnesota, yet in these three States there is a golden opportunity for aggressive car salesmen. Montana people have had greater incomes in 1916 than at any time in the last 10 or 15 years, and it is here that more of the big, high-priced cars are being sold in this State than elsewhere in the Northwest. There is more difficulty in getting cars for delivery than in selling them.

Tractor Industry's Capital

The agricultural tractor business, which may be said to have been in its infancy in the Northwest a year ago, has shown phenomenal growth. Minneapolis and St. Paul are now acknowledged as the home of the agricultural tractor industry, and whereas a year ago a few tractors were demonstrated outside the show, this year eight makes were exhibited inside the show building. The Twin Cities bid fair to become to the tractor industry what Detroit is to the automobile trade, Pittsburgh to the steel industry or Chicago in live stock. There has been considerable development in the tractor field within the last year, and much is expected in the future, as experimentation is carried on to a remarkable degree and many of these experiments no doubt will develop into worth while tractors.

Banner crops for the last 2 years have proved to the farmer the necessity for mechanical tilling of the soil, and it should be a source of satisfaction to the

tractor industry to know that so many of the farmers of this territory are now converted to automobiles. Since the farmer is a heavy car buyer, he has learned the utilitarian value of the gasoline engine, so that it is not necessary in selling tractors to sell him the engine. Farmers already are sold on that. The only question is that the farmer has enough ready cash to replace his horses with gasoline powered machinery.

It is a noticeable fact that the tractors exhibited at the show this week for the most part are moderate in price. It seems logical to suppose that the tractor industry will follow closely the trend exhibited in cars and trucks, since it is already true that the low-priced tractor is the one in which the farmers display the greatest interest.

Tractor manufacturers have found that the car dealer is the logical sales man of tractors since it has been shown that half of the cars sold in this territory at least go to farmers. From this it would be seen that it is quite in harmony with the present movement in the business of the car dealers to handle tractors, and it is not uncommon to see in the salesrooms of the various car dealers in Minneapolis the useful if not ornamental tractor lined up beside the latest models of automobiles and making a strong bid for attention.

Future Is Favorable

Whether we speak in dollars or bushels of grain makes little difference. It is a foregone conclusion that automobile sales in this great Northwest territory, which embraces 306,434 square miles, will be greater than ever before. Last year it was a story of tremendously greater crops than in 1915 or other previous years, while this year it is more a story of practically equal crop volume, materially enhanced in value. Last year the farmer's financial debts were cleared through the bumper crop which paid his back payments on lands, back taxes and redeemed his notes of more or less long standing and left him with money in the bank. Then came 1916 with high prices and a good crop which gives the farmer an income equal to that which he got the year previous, and inasmuch as he did not operate under the handicap of the previous year, he should be more than ever a good prospect for the sale of a car.

Just a word may be in order as to the vastness of this great territory. The entire population of the United States might be placed within it and there will be less than 350 people to the square mile.

Kentucky Licenses Number 20,637 in Jan.

LOUISVILLE, Ky., Feb. 10—The commissioner of motor vehicles of Kentucky issued 20,637 automobile licenses in January and received \$150,467.69, an increase of 69 per cent over last year.

Foreign Trade Department

Manufacturers Must Study French Market—War Region Covers Greatest Engineering and Raw Material District—Enormous Amount of Supplies Needed—Report of Special Committee of Fifteen

By David Beecroft

THE present condition of France, both the invaded area and the remaining part of the country, as well as the condition of France at the close of the war, are questions which every automobile, motor truck and accessory maker should adequately consider at these times. This applies also to manufacturers of tractors and those specializing in machinery for the automotive industry.

A most valuable work dealing on this subject is the report made to the American Manufacturers Export Assn. by the special committee of fifteen which spent some months last fall in France traveling over the entire country and investigating all of the industries. The report is a well illustrated volume of 250 pages which deals in a most comprehensive manner with the France of to-day, its manufactures, labor, credit, shipping, reconstruction work, personal welfare and, in fact, every phase of life which would interest a manufacturer anticipating building up French trade at the completion of the war or taking advantages of the possibility of reconstruction work in France after peace is signed. We are taking the liberty of quoting very generally from this report, a copy of which should be purchased by every manufacturer connected with the automobile industry.

Devastated Area

The report gives a very comprehensive conception of the area of France devastated by war and at present held by Germany. Approximately 4 per cent of the total area of France is now in the hands of the Germans, this constituting one of the richest sections of the country both from a point of view of production and also manufacturing. For example, quoting from the report:

"Eighty per cent of the iron ore is in this zone.

"Two-thirds of the coal mines in France is in this zone.

"Factories and mills to the number of 330 have been destroyed, throwing out of work approximately 57,633 persons, and depriving families of the workers of support.

"Four cities of over 100,000 inhabitants, Lille, Roubaix, Nancy and Rheims, are either occupied by the Germans or under fire. The population in this invaded district is about twice as dense as the average in France. In 1912, \$50,000,000 worth of cereals, or 10 per cent of the total production, was raised in this region.

Reconstruction Plans

"Seven hundred and fifty-three towns and villages have been in part or wholly destroyed. In these 753 towns, 29,594 buildings have been damaged and 16,669 completely destroyed. Of these, 15,300 are in the department of Pas-de-Calais. In the department of the Marne over 15,000 have been damaged or destroyed. In 148 towns over half of the buildings have been completely destroyed, and in seventy-four towns 80 per cent have been destroyed.

"There are in France to-day 928,000 refugees, driven away

from their homes, one-half of whom are under 16 years of age. Of these, 123,000 are Belgians. There are probably 120,000 others who are not recorded because they were self-supporting."

A good indication of how the new thought in standardization of materials has entered into the French mind is evidenced by plans already made for reconstruction work in this zone; and while this reconstruction work does not directly concern many in our automobile industry, it does sufficiently indicate or point to changes in French manufacture which we should be aware of. This reconstruction work, according to the report, divides itself into two classes:

"1—The necessity of rebuilding the devastated villages and towns has developed the thought of standardizing all materials such as window sashes, doors, hardware, wired glass, plumbing and lighting fixtures, cheap furniture, cooking utensils, house furnishings of all descriptions, etc. . . . There must also be a general replacement of all sorts of agricultural tools, implements, agricultural machinery. . . .

"2—The northern section of France is chiefly an industrial region in which are concentrated most of the important industries of the country; and as much of this section is still in the hands of Germans no accurate estimate can be made of the damage done. It is likely that many of the industrial plants will have to be rebuilt and much of the machinery will have to be replaced. . . . A special society, the central committee, has been formed for rehabilitation work in this section"

With this conception of the devastated area and the possible plans for rehabilitation, the report proceeds to give a broader conception of reconstruction work in France and suggests that while reconstruction work in the devastated area is large, it is possible that reconstruction work in other parts of the country which have not been injured by war will exceed that of the war-torn zone. The report goes on to show in a few details the broad nature of this work.

Under the direction of the Touring Club of France, it is planned to be ready at the end of the war to undertake immediately \$120,000,000 worth of construction, enlargement and reconstruction of hotels in the resort countries so much frequented by American tourists automobiling abroad. The hotel business is expected to be one of the first to recover after the war and to be placed on a substantial paying basis. A comprehensive campaign of publicity has already been started by the Touring Club of France through its 130,000 members to advise the world, that is, all countries outside of France, of the movement to inaugurate a first class hotel system in France and also to invite capital to take part in it. The French Government through the Senate and the Chamber of Deputies is giving it support.

We quote further from a report on this reconstruction work:

"It is being found generally in the industrial world that

co-operation and the exchange of experience and ideas are more important than competition. This is particularly true in the hotel industry. . . .

"A number of motor buses have already been put into operation throughout the scenic parts of France and many more will be established immediately after the war. The fine character of the French roads, together with the charm of country, adds much to the delight of this form of travel. . . . For some time an active campaign has been carried on to make known the scenic charms of France."

French Trade

For those U. S. A. manufacturers in the automobile industry looking to France specially as a selling field at the close of the war, it is best to bear in mind that Europe developed and perfected foreign trade. Foreign trade and foreign finance are creations of European brains and consequently we cannot expect that in the few years of war the United States has solved more of the problems of foreign trade and finance than Europe. Unfortunately the abnormal war trade has closed the doors of foreign trade education to us. We have been merely merchants filling foreign orders, rather than merchandising experts going into the foreign field and building up an export trade in the face of world competition.

In view of this we cannot do better than quote from the report substantiating the old-time honored conception of foreign trade, namely, that it is an exchange of commodities.

"If we wish to increase our exports to France we must be ready to import correspondingly more than we have done in the past. Trade is a matter of exchange of commodities; we cannot hope to increase our export trade under normal conditions without a proportionate increase of imports from the countries to which we sell."

As we mentioned in connection with our series of articles dealing with developing of export trade in South America, that it is always essential to send our best business men to foreign countries to develop trade by a careful examination of conditions, and later to place some of our own citizens in charge of the business, so we can repeat here. The report sums this graphically as follows:

"The country which expects to export its goods must first export its men. The proper method of developing business will be in most cases to send men to France who understand the language and are thoroughly familiar with French lines of manufacture."

French Financial Standards Sound

Many of our manufacturers may be holding back on foreign trade with belligerents owing to the question of financial soundness in those countries, and also because of credit terms that may be required. The commission went into credit matters very fully and is of the opinion that there is no other country in the world to which our manufacturers should be prepared to extend credit more than to France. This is largely because of the French national character and the national sentiment built up through centuries surrounding the question of meeting your financial obligations. The report expresses the situation thus:

"Credit can be given with more safety in France than in most other countries: Failure to pay a debt is deemed a disgrace which the whole family will try to prevent. Failures are rare. The responsibility of rural credit associations is amply provided for by law. We were reminded that our agricultural machinery sometimes is sold in France on three payments; one after the first, one after the second, and one after the third season, and that while it may become necessary to grant the same concessions on shipments made to France, the security can be considered at least as good."

The question of competition that we may expect from France after the war was investigated quite fully by the

commission in the various industries studied, and the consensus of opinion as expressed in the report, is that there is little possibility of large surplus stocks of French goods manufactured under war-efficiency methods at present, and that there will be little danger of the American market being flooded by such.

France and America Not Competitors

The report takes the view that France and America are not likely to be serious competitors in the world market because their strength lies in different directions. The answer to this is found in the national characteristics of the two countries, France with strong tendency toward individual design and manufacture, and America leaning toward production of standard types in great quantities. It is worth while quoting from the report on these two national characteristics.

"French manufacturers are likely to go further than they have already done in their effort to meet the demand for high grade merchandise made up in particular ways for individual customers, and in relatively small quantities for a high class trade. . . . The French industry has arisen primarily to satisfy home wants, which are not large but very diversified. This has enabled France to meet the varied wants of other countries and to fill relatively small orders for specially artistic goods with special imprints and special styles of packing and to do so at reasonable prices and yet with great profit.

"In many industries it will not pay French plants to enter upon large and continued production of one article in great quantities; but on the contrary the peculiar strength of French industries lies in the fact that their plants are capable of turning out a great diversity of articles, each finished with artistic production, in a way which other countries cannot because such excellence is the result of the artistic endowment of the French people.

"It is admitted that in all French industries the factories could be improved, and that a better sequence of operations could be adopted, but it is contended that the production itself should remain diversified as heretofore. Extremists championing this view sometimes go so far as to oppose a general introduction of machinery, automatic tools and labor-saving devices on the ground that the product would thereby lose some of its artistic qualities.

"It is reasonable to expect that in those lines in which France intends to supply her own wants entirely, production operations must be more generally adopted, and this may result in surplus production that could be successfully exported."

In contrast with these national French characteristics with regard to manufacture, the report sets forth that U. S. A. manufacturers are only interested in exporting their surplus product and that they would not be well qualified to compete with France in special products.

Will Need Improved Machinery

While the report does not specifically state that there will be a great deal of reconstruction work done in factories after the close of the war, it does throughout its pages breathe the impression that already much has been done in production manufacture in France. Two cases are specifically cited, one motor trucks and the other munitions. Modern machinery and labor-saving devices are not used in France to-day to the same extent as in the United States, in plants of corresponding importance. Labor-saving devices and improved machinery will, however, be required as never before, and designs which have been developed under high labor costs and great production in America will probably receive favorable consideration in France. The war has already stimulated development along these lines more than many years of peace would have done. In the steel industry, as well as in ord-

nance factories, hydraulic forging presses and high-pressure pumping machinery have been installed. Many of these have come from the United States. The demand for such machinery has passed its maximum and will no doubt practically cease with the end of the war.

The fact that France does not view with antipathy our prestige in production methods is shown by the sentiment widely met throughout the country that French industry will welcome American manufacturers and American capital co-operating with French interests in the erection of new factories in the country. This suggests the possibility of American manufacturers of production cars probably being welcomed in the French field. It is possible that even yet France has not accepted the production automobile and that she would welcome American factories in the country to build this type.

Some useful information is given in the report on the great problem of labor which has been one of vital concern to the United States manufacturers. Both labor and the cost of living have gone up in France since the war, but perhaps not to the same extent as in America. The great influx of female labor has to a large extent made up for the depletion of men workers in the factories. Female labor has been placed on a par with male labor in many factories so far as pay is concerned. It appears that in factory work woman is practically as efficient as man and requires less supervision. In the agricultural field woman has not been so successful in France and last year's crop was approximately 25 per cent short, largely due to female labor.

In French factories the working day averages 10½ hr. Previous to the war there were many factories operating on 8 and 9-hr. schedules, but these were generally increased to 10 hr. when the war started. French factories have taken advantage of every possible factor to keep production up to standard. It has been found best to alternate day and night shifts from week to week, rather than keeping one set of men or women constantly at night work and another at day work. Under this condition the work of the night shift is practically as good as the day shift. Night work generally falls off in efficiency between the hours of 2 and 4.

The cost of living in France averages one-third to one-half higher than at the beginning of the war and still rising. Certain commodities have advanced as much as 50 to 100 per cent.

Generally speaking, the cost of labor has advanced from 30 to 70 per cent; highly skilled work in some instances as much as 100 to 150 per cent.

We quote from the report on this subject:

Women in Every Industrial Branch

"Apparently women doing work in factories that involves no prolonged training receive from 70 cents to \$1.20 per day; and men of the same class from \$1 to \$1.80 per day. Skilled agricultural labor, such as vine trimming, cheese making, etc., is 80 cents to \$1 per day. . . . There is no indication of a decrease of the present wage scale after the war. It is believed that wages will remain substantially at whatever point they may have reached at the conclusion of the war. It remains to be seen at that time to what extent women will remain in the industries.

". . . Much of the munitions work is done by the piece, male and female labor being paid on the same basis. In other forms of labor the turn is 75 per cent of that of the men for woman labor, especially where the work is of an exhausting character. Under the stress of urgent necessity, it has been found possible to employ women even in the heavy work of steel plants. We saw women handling shells as they came white hot from the furnace. Women run large machines, such as lathes, etc., which it has been assumed could only be handled by trained mechanics."

The more general employment of labor through French factories has already resulted in many factory improvements for workers' welfare, as well as the installation of many labor-

saving devices. Special washrooms have been installed; special arrangements have been made for the preparation of hot food; dining rooms and rest rooms have been provided, especially for those who work at night; and arrangements have been made in factories to obviate the necessity of women lifting heavy articles. In some factories women are allowed to leave their children in the care of trained nurses in homes near the factories.

Child labor has always been a factor in France, and according to our standards, children begin work in French factories at too early an age. The French nation is considering this problem and realize very fully that the future of any country depends on the care given its boys and girls. The report states that, "In many factories munitions girls were working with their mothers, the mothers instructing the daughters and keeping in touch with them during the day. The results were very satisfactory. Children generally work the same hours as adults . . . children enter some factories at 12, and until they are 18 are protected by a number of laws regulating wages, sanitary conditions, rest, hours of work, etc. . . . In many plants boys are paid more than girls doing the same work, because they come to the plant as apprentices, whereas many of the girls remain only from 12 to 18 months."

Low-Priced Automobiles Needed

The agricultural status of France is perhaps not as correctly understood as it should be, and particularly as it has a very direct bearing on the possibility of using farm tractors and also low-priced production motor cars. France is very rich in land and has a very high percentage of its total area under cultivation. Out of a total area of 133,000,000 acres there were 59,000,000 acres of plowing land in 1912. It is estimated that there are about 85,000 farms which should be using motor apparatus for plowing, etc. The commission estimates that this would give a possible field for 17,000 motor tractors, such as we are building.

Generally speaking, French farms are small, the average being 22 acres. This would seem to cut down the possibility of selling tractors or automobiles, to a very few of the 5,500,000 farms in the country. The government has, however, for 2 years been encouraging farmers to get together in groups of seven or more and purchase motor equipment. With this object in view a decree was granted in September, 1915, permitting such co-operation among farmers. Already this is showing results. The French peasant is exceptionally frugal, and while they have not been good spenders in automobiles they have had sufficient money, but it has generally been invested in national securities.

Better Shipping Facilities Planned

The report analyzes exhaustively the question of foreign shipping and the enormous work France is doing in improving her great seaports. Much work is already under construction and plans have been completed to carry this on for many years to come. At the present time there are sixty-six steamship lines running from Marseilles to all parts of the world. The port of Bordeaux has sixty different steamship lines, and the other large ports are similarly well cared for. The report mentions that during the year 1915, Rouen, a port inland on the Seine River, had 3969 merchant ships during the year and only four of these were American. During 1916 ten American vessels entered this port. Rouen is the fifth port in France.

Already there is much reconstruction work taking place in many of the older French cities, much of which has been started as a direct result of the war. In one city 35 acres of old buildings have been destroyed to make way for modern construction. In other cities similar reconstruction work is under way.

Engineering Progress Analyzed

Part I

Attainments in Performance, Comfort and Appearance as Exemplified in Cars at the National Shows—An Intimate Study of Chassis and Bodies

By J. Edward Schipper

Technical Editor THE AUTOMOBILE

A REVIEW of the great national automobile shows from an engineering standpoint means an inspection of the entire progress of the year. To attempt to do this in a short paper as this is quite similar to delivering a lecture on the world by the aid of a small globe. We will have to be content therefore with a view of the industry through the wrong end of the telescope, merely turning the glass around to observe some of the prominent heights and valleys. It is upon these high spots that discussion will naturally be focussed, and it is upon these pertinent questions that we are most anxious to shed the light of crystallized opinion.

No one thought stands out more clearly to a student of the shows than that this has been a great year for detail. Few if any basic movements can be seen and few if any great innovations. Nevertheless it would be wrong to say that there are no well-defined trends, but even these with a few exceptions are shown by changes in detail rather than in a radical or fundamental departure from previous practice such as featured the early days of the industry.

To appreciate what each of the changes to be noted is intended to do, the ideals toward which we are working in automobile design may be reviewed:

Better performance is the first. This means a greater speed range on high gear, better acceleration, better economy, longer life, silence, easy starting and other factors which render the car a vehicle which can be started, operated and cared for with the least trouble and expense and with the greatest amount of satisfaction to the user.

More comfort is the second. In this phase of development is included everything which makes the car a better vehicle to ride in. Better spring suspension, better upholstery, better body proportioning, ease of entrance, convenience in use in all kinds of weather and over all kinds of roads, convenience in night driving, in making minor adjustments and repairs such as tire changing, brake adjusting, battery filling and even gasoline and oil replenishment.

Finer appearance is the third. What this includes is self-evident. Body outline or profile, the finish and trim of the exterior and the design and adornment of the interior from the appearance point of view are all included.

Under the heads of performance, comfort and appearance our observations will fall and each detail considered will in the belief of the engineer who adopted it be a small or large step, in his opinion, toward one of these three goals. If the change has not done one of these three things it has not been a gain

from the user's standpoint although there is another consideration which we will not take up except in passing, and that is better manufacturing possibilities. The latter, while of enormous importance will be neglected for the time being in order to limit the scope of this paper as much as possible.

A glance at the requirements for better performance shows that insofar as the engine is concerned, a great many of the desired ends are closely bound up with higher mean effective pressures. This is reflected in the higher speed range, better acceleration and indirectly in other directions. The matter of higher mean effective pressure is naturally concerned with higher volumetric efficiencies, and this brings us directly to the first of the observations on the cars as they are shown at the national exhibits.

The sixteen-valve four, the better designed port, larger valves, larger intake passages and indirectly even the more efficient hot air stoves on the exhaust pipes are all concerned. There is hardly a car at the show that does not exhibit changes in the arrangement of its gas passages and in the increased temperature of the mixture.

This is the first year that the stock sixteen-valve four has been exhibited at the national shows. There are three, two of which are developments by concerns which have been in the industry almost since its inception. The great importance of volumetric efficiency is recognized everywhere. The nearer that the intake stroke can come to filling the cylinder 100 per cent full, the nearer the maximum horsepower to the secured from a given displacement, with all other points in design being equal.

Demand for 16-Valve Four

Both the manufacturers who have put the sixteen-valve car into actual production report a quick public demand and around the chassis at the shows there was an appreciative audience who listened to the claims of the lecturers. The advantages that the latter put forward are primarily bound up in the question of volumetric efficiency, but beyond that other claims are being made. These include smaller valves for the same area, increased period of maximum opening, cleaner scavenging due to the elimination of pockets and reduction of carbon deposit. No disadvantages were mentioned.

The fundamental conception which is responsible for the sixteen-valve four, and the considerations which follow as a natural consequence of it, form probably the most important point in the entire show and doubtless there will be a few

EDITOR'S NOTE:—This is the first installment of a paper to be presented before the Detroit Section of the Society of Automotive Engineers Feb. 16 in which Mr. Schipper summarizes the results of an extremely close analytical study, not only of the automobiles at the national shows, but also of the specifications and details of design characterizing 1917 cars of all American makes. Mr. Schipper has been cultivating this field of research for many years and is eminently qualified to review the subject.

remarks heard upon it, as it is widely known that several related developments have acted as playthings elsewhere than in the factories that are producing them.

It is not only by the addition of valves that higher volumetric efficiencies are sought. There are several notable manufacturers at the shows who stated that their motors are from 12 to 20 per cent higher in power than they were a year ago without any great change in piston displacement. Smoother ports, altered cam design, increased intake valve size, shorter manifolds, elimination of bends in the gas passages are universal. This year there were several cars exhibited in which the intake valves were larger than the exhaust. This is a reversal of what was thought to be the best practice a few years ago when the exhaust passages were in a great many instances considerably larger than the intake.

Overhead Valves Increasing

Another line along which the higher intake efficiencies have been sought is in the increased use of overhead valves. The overhead action in which the valves open directly into the center of the combustion chamber from above is on the increase. The old objection of noise seems to have been greatly done away with by the use of covers, by inclosing the wearing points and by the reduction in clearance due to a redesign of the valve actuating parts. Claims of great horsepower to weight ratios are being made by nearly all the concerns having engines worked out along these lines. One newcomer in the small car field who exhibited both at New York and Chicago showed a $3\frac{1}{4}$ by $5\frac{1}{4}$ four-cylinder engine which developed slightly over 42 hp. at 2400 r.p.m. according to tests carried out in a prominent commercial laboratory in Detroit. This

works out on the B.H.P. = $\frac{P \cdot L \cdot A \cdot N \cdot E.}{33,000}$ formula, at 106 lb.

per square inch m.e.p assuming $E = 75$ per cent mechanical efficiency. Brake m.e.p is 80 lb. per square inch. At a car weight claimed to be 1900 lb., although I have had no opportunity of checking the figure, this would mean a horsepower for every 45.3 lb. of car weight, and a horsepower for every 4.13 cu. in. piston displacement.

This is cited as a typical example. It illustrates what is seen on every hand at the shows this year in a reduction in car weight and an increase in available horsepower at wide open throttle. The torque at the lower speeds, however, has not always been given the same attention, although it can be taken as a general fact that torque curves are flattening out. This again comes back to higher mean effective pressures and is largely due to the better filling. The most important result of the high power to weight ratio is of course in accelerative ability. The demands of the public are for quick get-away and naturally this means high power. It also means that our normal traveling has to be done at low throttle opening with a consequent low thermal efficiency. The question of performance at low throttle openings is a much more important topic than can be adequately dealt with in a paper with a wide scope, and naturally is something in which the carburetor designer is interested as well as the engine designer.

Detail Engine Changes

Detachable cylinder heads are increasingly prevalent in cars using small-bore power plants in either four or six cylinders. The difficulties of keeping the gasket tight have led to a redesigning of some of the engines that were shown with detachable heads a year ago. In one instance where a new head has been fitted, the change was made because it was noted that when tension was placed on the studs holding the head in place there was a tendency to draw the valve seat out of round. The amount of metal around the studs has been increased and the stud itself carried further away from the valve. The number of studs in other designs has been increased in order to give an even distribution of pressure all over the surface of the gasket.

On the stripped chassis and the cut-away engines the lecturers discussed balance. The educated car buyer does not like vibration and knows enough to ask what is being done to eliminate it. At the Chicago show there was a small gasoline power plant used in connection with a gasoline electric in which the gasoline engine is designed to run continuously at close to 3000 r.p.m. The counterweights on the shaft of this engine are carried as close to the plane of rotation of the crank center as is possible, still leaving a passage for the connecting rod. A number of improved shafts for sixes also were to be noted with a large following for the curved-check shaft.

Influence of the Fuel Question

The fuel question is exerting an important influence. Some signs of the descending grades are noticeable on every car in the show. Hot air stoves are more elaborate than ever before and in spite of the struggle for higher volumetric efficiencies, the use of the heated intake manifold is growing rapidly.

When it is considered that the temperature of the intake manifold in winter is quite often below the dew point of the present grades of fuel when the vacuum in the intake is within certain limits and at the mixture proportions in general use, the tremendous importance of this manifold temperature will be realized. On all the cars shown there is evidence of the practical realization of the problem, and it is hard to tell where the carburetor makers have ended and the car makers begun. It has been realized that with the present grade of fuel the manifold must complete the work of the carburetor or at least not detract from it. It is hard to say, looking at the show chassis which represent the thought that has been put upon this point, if the carburetor has been reduced to a simple mixing contrivance with the work largely carried on by heat in the manifold, or not.

If the heated manifold is to do the work, it seems impossible to have the same design as applicable to the heated summers of the South as to the cold winters in the North. Particularly as in many instances the warmer climes have the more volatile fuel. Prospective car buyers who keenly follow developments in the automobile engineering field have already started to ask that question.

Along the same line almost a dozen makers were on exhibit with thermostatic or other control of the water temperature. Some used the shutter controlled by hand, and at least one inquirer was heard to ask if the shutter were thermostatically controlled, a development at present under consideration. It has always seemed incongruous to see a \$3,000 car with a piece of newspaper across the front of the radiator. It is regretted that there is not more opportunity to dwell on the temperature question, as it seems to embody some of the most important considerations that are before the automobile engineers of to-day. The question is being wrestled with by engine builders and carburetor maker alike and the necessity of co-operation cannot be too well realized.

Engines Generally Not Lighter

Generally speaking, engines are not lighter than they were at the shows in the beginning of 1916, although developing more power per weight unit. Reciprocating weights have decreased still further, but it is doubted if the aluminum alloy piston has taken any firmer hold. It still seems to be occupying the debatable ground and those who have it are very strongly in favor of it, while those without it are just as strongly opposed. Inquirers at the exhibitors' booths could get plenty of information on both sides of the questions. One point, however, which is very noticeable is the fact that engine manufacturers generally have learned how to make lighter iron pistons. Just as the multi-cylinder engine has forced better performance from the four, so the aluminum piston has forced better iron pistons. Some of the latter are now made so light, that the direct saving in weight by using an

aluminum piston with its heavier section is quite small and negligible except at very high speeds. It is noticeable that the aluminum piston is in far greater favor among the car manufacturers who make their own engines than it is among those who make engines for the trade. Where aluminum pistons are used they seem to be longer than those first employed.

Some New V-Engines

Some new members in the ranks of the V-engine manufacturers demonstrate, what was predicted generally 2 years ago, that the type had a definite field and would increase. One of the new eights is a Knight and the other an overhead poppet type. Both are produced by concerns that are noted for their great quantity production and hence whose endorsement carries a great amount of weight. Talks with those showing the type and others indicate that on every hand it has been considered a matter of cost and performance. Some believe that they can secure better performance from the eight for the same cost as the corresponding six, and vice-versa. The shorter, stiffer shafts of the V-engine are dwelt upon at length by the demonstrators of the type as well as of the smoothness of power flow; those who speak on the other side mention equal performance with easier maintenance, thus leaving the question open to debate with a growing popular demand for the V-type.

Pressure Oil Feed Increasing

One of the points most frequently asked about by the show visitors is the oiling system of the car. The increase in pressure feed systems is particularly noticeable. The increase in pressure systems and in the amount of pressure used has gone up almost in direct proportion to the increased piston speeds of the engine. With many designers stating that a piston speed of 2000 ft. per minute is desirable for passenger car service, naturally a great amount of attention has been focused on the maintenance of the oil film.

This is a trend that has been growing. A census taken at the shows in 1912 showed 10 per cent of the models using pressure feed and 20 per cent using a combination of splash and pressure. This is a total of 30 per cent, putting the oil into the main bearings under pressure. To-day 30 per cent of the chassis models use full pressure feed and 35 per cent splash and pressure, or a total of sixty-five feeding by direct pump pressure to the bearings. It is not uncommon to have the oil pressure as high as 40 lb. per square inch with the oil exercising a marked cooling effect on the bearing. The question of taking the heat away from the oil is an important one, and recent reports show that special provisions are under development for this purpose. In fact, crankcase temperatures are being studied more carefully than ever in an effort to preserve the quality of the oil to as great an extent as possible. This is particularly important in view of the great amount of unburnt fuel which is finding its way into the crankcase and destroying the quality of the lubricant.

In cooling there is very little to be noted from a superficial examination of the show cars. Pump cooling leads, with about 66 per cent of the chassis using it. With the detachable cylinder head it has been found necessary in a few instances to increase the amount of water around the head. It may also be stated that on the newer engines more care is being used to eliminate steam pockets and hot spots due to masses of metal. The water is being carried closer to the exhaust passages and also closer around the spark plugs.

Gas and Combustion Chambers Refined

Valve actions do not appear to be greatly different. In the overhead rocker arm type there seems to be a tendency toward a differential rocker. With this the travel of the rocker on the push rod side is less than on the valve side. This permits of a lighter spring for closing the valve due to the leverage. Another gain claimed is in a quicker lift with

a longer maximum opening, a detail that again reflects the effort for higher volumetric efficiency. On the other hand, others have not adopted it, on account of the difficulties entering into replacements, while conceding some of the advantages. The service station would be forced to carry an entire different set of valve parts.

It is in the combustion chamber that some of the most important changes of the year have taken place. By changing small details and by an alteration in the gas passages, the power of the engine has often been increased to a surprising degree. One interesting detail which illustrates this is where a maker has made the gas passage below the valve in venturi shape with the throat of the venturi just below the valve and so arranged that the valve seat forms a continuous part of the venturi wall. This is on the small four mentioned as part of the gasoline-electric unit at the Chicago show.

Before leaving the combustion chamber a detail in manufacturing practice may be mentioned. This is the accuracy being required for equality of combustion chamber volume. One manufacturer of fours insists that the combustion chambers check within 3 c. c. for accuracy. With the great care taken in balancing the high speed engine the need for accuracy in this respect is naturally self-evident.

A development of the power plant that is receiving more attention every year is its accessibility. The national shows are visited by large numbers of repairmen who come for the purpose of seeing developments from their angle. Naturally one of the first considerations is accessibility. Engines which can have the pistons pulled out from the bottom without removing the crankshaft are well liked and are being looked for. This question has been given attention wherever feasible. The detachable cylinder head involves the gasket question and there is a great amount of difference of opinion as to whether the gaskets can be kept tight with the high compression engine. Another point is oil pump location, and the ease with which the pump can be removed. One new stock engine used in several cars has the oil-pump so that it can be removed quickly by taking four studs out of the bottom of the case. Others are working along the same line.

Clutches Must Disengage Without Drag

After the power has been developed the next question is to transmit it efficiently, and the improvement in power plants is naturally reflected in the transmission units throughout the chassis. The first of the units, the clutch, shows the improvements clearly. Examining fifty-four stripped chassis at the New York show and the fifty-two at the Chicago show, one of the facts that stands uppermost is the falling off in the number of adjustments. The majority of clutches examined were those made by standard parts makers and talking with these, the opinion cannot but be gathered that there is a practical unanimity of aim. This is briefly to secure the lightest possible efficient clutch for the torque and power delivered, and to have this clutch automatic as regards lubrication, with wear compensation in the mechanism itself.

Many of the clutches shown on the chassis have no adjustment except that on the clutch pedal. A running distance of 50,000 miles or more without attention to the clutch is claimed by some.

Clutch linkage has been altered. One of the newer cars exhibited at the shows makes a point that the clutch can be disengaged by the pressure of the hand. This means that the travel of the clutch parts for disengagement must be small, because the distance that the pedal moves is about the same as usual. Another possibility is increased area of frictional surface with a lighter engaging spring. The use of fewer disks on the disk type, which is increasing, reduces the necessity for long travel in disengaging and is one of the factors that is making for lighter acting clutches.

The increase in the speed of rotation of the clutch parts due to higher gearing at the rear axle has had a result in

reducing the torque which consequently has its effect on clutch design. Lightness in the rotating parts of the clutch has increased with a tendency toward quieter gear shifting. No great increase in the use of clutch brakes could be noted, but on inquiry it is found that quick release is being made a particular study and where it is secured the clutch brake has been done away with by some makers. This quick-acting release is simply a prevention of drag while releasing. It is this drag of the clutch when it is not fully released that gives clash in shifting gears.

Gearboxes Not Changed

As far as the gearbox is concerned there is little change to be noted. The unit power plant is still gaining with a notable increase in the use of the standard S. A. E. bell housing. There has been some simplification in the mounting of the control levers and also an increase in accessibility. Iron is used to a greater extent in gearbox housings this year because of the higher price of aluminum and also because of non-resonant qualities. The unit power plant is now used on 77 per cent of the chassis.

A feature in transmission units that will bear watching is the use of the electric transmission. At the Chicago show were three cars using three different forms of electric transmission. The question as to whether the gearbox will eventually be eliminated could certainly not be answered from a study of the show, but the exhibition of three distinct types of gasoline-electric drive is highly interesting. In addition, one car showed the magnetic gearshift as standard equipment. All of these attracted an unusual amount of interest.

The full floating axle has dropped slightly in the percentage figures of chassis listed. It is now 43 as compared with 52 a year ago. Semi-floating has gone from 23 to 25 per cent. The use of spiral gears has increased owing to the fact that it is now a little easier to get the equipment for cutting them. They are now on 70 per cent of the chassis models.

Semi-Elliptic Springs More Popular

One of the most notable changes of the year is in spring suspension. This may be realized from the fact that there are more than twice as many models with semi-elliptic springs than a year ago. The percentage of cars using semi-elliptics, from a census taken at the show this year is 36. Last year it was on 15 per cent. The drop-off has come in the three-quarter elliptics. A year ago these were employed on 42 per cent of the chassis; they are now on 27 per cent. The percentage using cantilever springs remains the same. There is a tendency toward placing the springs directly beneath the frame instead of to the side.

Hotchkiss Drive a Factor

Probably the spring change has been influenced more than anything else by the use of Hotchkiss drive which is now on 44 per cent of the chassis models. The half-elliptic springs along with the other types have been lengthened on a great many of the cars, and the study of easy suspension is one of the most important factors in the comfort of the present chassis. The increased deflection per unit of weight gained by longer springs has resulted in a redesign of brake layouts in some cars. This is particularly true where the Hotchkiss drive is used, as there is always danger of brakes binding if the centers and radii are not carefully laid out.

Brake details have been given more attention this year than for some time in the past. One of the reasons is the increased use of Hotchkiss drive. The points in which the brake designs are better are particularly in the equalization, in the elimination of rattle, and, as mentioned previously, in the proper layout of pivot centers and link radii. Quite a few are using a continuous cable equalizing system in which the cable runs over pulleys; others are using cable to supplant the linkage. While on the subject of brakes, the vacuum brake which was demonstrated at the

shows cannot be passed by without mention. This is a matter of which the true value will be determined by experience. Probably everyone is familiar with the operation of the vacuum brake, in which the suction in the intake manifold amounting to a few pounds per square inch, negative pressure, is converted into a large force by the use of a piston of large area. A system of levers reduces the travel and multiplies the force correspondingly so that a powerful pull on the brake rod is obtained.

Electrically it cannot be said that any radical developments are to be noted. There has been further improvement in the mounting of some of the generators and starting motors, but in the design of the instruments themselves the changes are very slight. One prominent manufacturer has shifted his generator up with the fan and drives both from a V-belt. This is on an eight-cylinder car and it gives a very compact layout.

The Bendix gear is seen on what would seem to be on casual inspection a considerable majority of the cars. There are many magnetic engagements for the starting motor and a few mechanical shifts.

Two-Unit Electric Systems

The use of two-unit starting and lighting systems has increased. Probably the increased engine speeds are responsible for this to a great degree as well as the increased simplicity of generator drive. Another point in which increased simplicity is notable is in the generator output regulation. The three-brush system seems to be on the increase as compared with a year ago. The vibrator type of regulation is also more than holding its own, with bucking coil and others in the minority. No figures have been compiled on the percentages using the three types, but careful observation will confirm the trend toward the two first mentioned types. It is clearly noticeable that there are not nearly so many complicated systems as existed 2 years or even 1 year ago. One electric company has brought out during the year and incorporated on some of the cars at the shows a thermostatic unit which alters the charging rate to conform with the temperature conditions. This is a simple device, when analyzed, which simply switches in a resistance when the temperature of the generator increases above a predetermined amount. This temperature is generally about 150 deg.

Improvements in Ignition Field

Some real development work has been done in the ignition field as is quite evident on standard equipments. Probably the most noticeable feature is the better and more compact combination of the distributor and generator. The action of breaker mechanisms has been speeded up so that there is no trouble in handling even the most rapid of high speed engines. One manufacturer has brought out a new system which is seen on some of the cars and at the booth of the exhibitor, where the movement of the contact point is only 0.006 in. This is a closed circuit outfit.

(To be continued)

Mechanical World Diary

THE thirtieth annual edition of the British Mechanical World diary and year book is now on sale in the U. S. by Norman Remington & Co., Baltimore, Md. It is one of the handiest compendiums of mechanical information and the fact that it deals with a number of British standards does not detract from its American usefulness. It contains information on almost every ordinary mechanical problem, from the best methods for soldering to the design of conventional machine parts. In the new edition sections dealing with heat treatment of simple steels, tables, for calculating the strength of coil springs and sundry other matters have been added and the book is remarkable value for money at its price of 35 cents, or 40 cents by mail.

Chassis Oiling Needs Attention

Present Methods Behind Other Features in Design Progress—Advantages of Oil-Wick Feed Recommended by Some Authorities

CHASSIS lubrication is not as far advanced as other parts of car design. It is one of the details that has been overlooked while progress was being made in practically every other direction. There is hardly an automobile engineer who will not admit the faults of grease cup lubrication and particularly grease cup lubrication in which the cups are out of sight. The old rule of "Out of sight, out of mind," fits these cups very well.

It is natural that attention should be paid to the lubrication of the engine, for if it were not, the engine would not run. It is almost regrettable that the chassis will still run if no attention is paid to the lubrication, as it would then force a little more attention from user and engineer alike. The engineer in his efforts to make it easier for the user would have produced a better method than is found now.

Grease-Cup Troubles

On some of the 1917 chassis there are as many as five and even seven grease cups located beneath the chassis in such a position that a man with his ordinary clothing on cannot think of trying to reach them. All these cups need turning at least once a week in ordinary running. The two conditions are incompatible and the result is that the cup goes unturned. The cups are also of such a construction that they are readily knocked off, particularly in truck work. A passenger car with from one to three grease cups missing after a year's service is not an unusual, but the *usual* thing.

In an effort to solve the problem, which is becoming universally recognized, there are a number of engineers at work. A system designed by C. T. Myers and carried out in his work on the Fageol trucks is illustrated on this page. As will be seen from a cursory study of the drawings the lubricant is oil. The advantages claimed for this are: First, the nature of oil to find its way to all working surfaces; second, the fact that a perfect film is presented; third, the non-dirt-carrying qualities; fourth, the absence of necessity for frequent attention, and fifth, the fact that the lubricant is supplied in proportion to the work done by the bearing.

It is pointed out in this plan of chassis lubrication that grease seeks the path of least resistance and will always try to escape from the bearing without lubricating it. It will lubricate only the surfaces which lie in its direct path of flow and will not readily be carried to all points of the bearing. Oil, on the other hand, will reach everywhere. It establishes a film between the rubbing surfaces automatically.

With the wick system as shown there is no possibility of carrying the dirt from the well of lubricant to the bearing

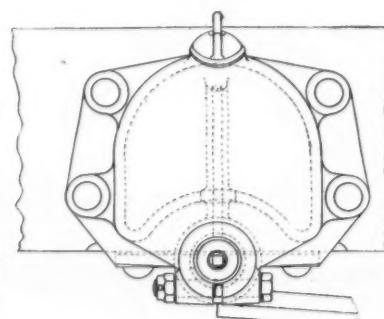
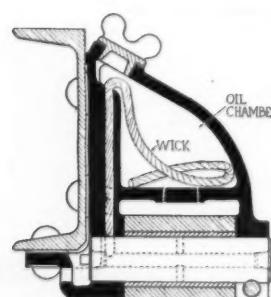
surface. In fact, it is pointed out that a handful of dirt could be gathered in the oil chamber without in any way affecting the efficiency and cleanliness of lubrication. The oil is drawn up through the wick by capillary attraction and only the liquid lubricant will be so conducted.

Reservoir Size Optional

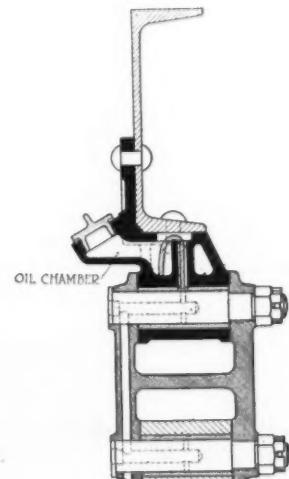
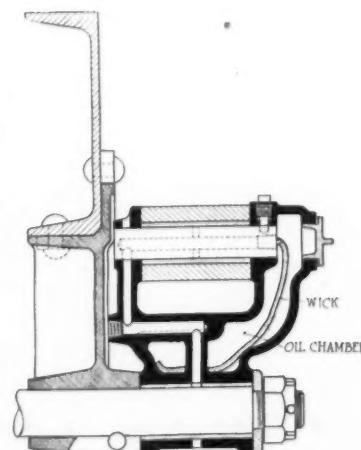
To avoid the necessity of frequent attention the oil reservoir in the system can be made as large as desired. With the proportions shown there will be enough lubricant contained for a month. The feed, of course, is automatic because of the wick arrangement and regardless of the amount in the supply compartment the rate of feed will depend only upon the amount used. The greater the motion of the bearing and the greater the amount of oil consumed, the faster the supply of lubricant will work its way through the wicking to the surface.

While the spring shackle oiling is the most serious of chassis lubrication matters there are also many other parts, notably universal joints and link joints in brakework, etc. The latter appears to be best taken care of by self-lubricating bushings where the designer has allowed sufficient dimensions to make these possible. Larger yokes and rod ends are being used by some manufacturers and equalizing shafts often have bigger bearings than formerly, permitting the use of softer bushing materials that do not need oil or grease but will not rust if left alone.

Universal joints, however, still require to be packed with grease every so often, and the packing is a horrible job. Luckily once is enough for a good many miles of running, but it would certainly be better for the life of the joints if something could be done to make it easier to attend to universals. The simplest plan is for the body to be provided with removable parts in the floor so placed that the joints can be got at from above, but there is room for a clever designer to provide for automatic oiling of the front universal from the gearbox and of the rear one from the axle. Schemes of this sort have been tried, and usually the trouble was that too much oil was supplied, but this should be possible to overcome; it must be no more than a matter of experiment to find the proper answer.



Sections of oil reservoir spring brackets



Aeroplane Wing-Trussing*

A Clear, Simple Explanation of the Fundamentals of Aeroplane Construction

By F. W. Pawlowski †

IT is hard for an inventor or designer to break away from the forms, types or examples already existing in nature; the first efforts to build a flying machine were therefore attempts to imitate the flapping of birds' wings, just as there were attempts to build locomotives that moved on legs.

We know how the aeroplane was finally created. It is not a replica of a bird; it does not imitate the bird-motions in flight (except to a certain extent in gliding flight), but it still retains the essentials of a bird's wing, although modified and immovable.

The problem faced by our predecessors was to build wings large enough for a man-carrying glider or aeroplane and was an extremely difficult one. They had to answer these questions: How was the big wing surface to be made of light weight and rigid at the same time? How were the members of the wing framing to be arranged?

Monoplane Wing-Trussing

The examples furnished by nature in the wings of insects, birds and bats, already adopted for the construction of the umbrella, imposed themselves so strongly upon the minds of inventors that it is no wonder we find their application in the early flying-machine, and even in Lilienthal's (1896) and Pilcher's (1899) gliders, Fig. 1, and Ader's aeroplane (1897).

The fact that Henson at the early date of 1842 adopted the Fink truss for his wing construction must be considered and recognized as extraordinary. High credit must be given his power of mind and constructive ability. The Henson wing construction contains all the essential elements of the modern aeroplane wing, such as front and rear spars, and main and secondary ribs. The reduction of the number of exposed wires as compared with the umbrella type was considerable, and it is really surprising that Lilienthal, Pilcher, and others did not adopt Henson's construction. Much later (1909) Levasseur adopted it almost without change for his Antoinette monoplane, Fig. 2. In this, as in most of the following figures, all the so-called lifting wires are shown by full lines and the so-called landing wires by dotted lines.

Several other designers of recent date adopted Henson's construction also, as it has the advantage of keeping the wings rigid even after they are detached from the body.

Although, in the meantime, the biplane wing became more prominent, we will proceed with the evolution of the monoplane wing. In 1910 Blériot adopted the Pratt truss, already popular in biplane construction, for his monoplane, which was of considerable span, Fig. 3. He evidently resigned voluntarily the possibility of almost doubling the wing area without much increase of resistance to motion.

Just a slightly different construction has survived until the present time in the German Taube, Fig. 4. The standard type of monoplane rapidly became the most popular on account of its simplicity of construction and ease of adjustment, Figs. 5 and 6.

The use of four pairs of lifting and landing wires on each wing, as in Deperdussin's seaplane, seems to be an unneces-

sary introduction of too much structural resistance. Two pairs of wires, Fig. 6, are the best, and are sufficient even for large-span machines; one pair of wires is sufficient for small-span racing machines. An example is the Ponier machine, which competed so splendidly for the 1913 Gordon Bennett Cup.

It is worth while to notice that in 1900 this type of wing trussing was used by Kress for his flying-boat, which was of a triple-tandem monoplane type, before any other machine flew. The interesting thing about it is that Kress was not an engineer but a tailor.

The resistance of the wires is a considerable item in the total structural resistance, so that Blanc in France actually built (1913) a monoplane with cantilever wings, Fig. 7, a rather risky construction considering the wing area used.

Biplane Wing-Trussing

The difficulty of building large wing surfaces was realized as far back as 1866 by Wenham in England. He built a sort of multiplane kite, while Stringfellow in 1868 produced a triplane model, which unfortunately did not fly. But in spite of the remarkable example of Stringfellow, such prominent mechanical engineers as Sir Hiram Maxim (1888) with his huge multiplane, and Lilienthal (1896) with one of his biplanes, could not produce a simple and statically clear structure to combine the planes of their machines. A bridge engineer was the first to do so, and it was Octave Chanute who put the bridge truss in the biplane. Of course, it could be the Pratt truss only. The idea was adopted immediately by all airplane builders. As few of them were closely familiar with the principles of frame structures, there was some abuse of the "struts and wires" so that many biplanes of the early part of the modern era of aviation resembled closely the wire entanglement for field fortifications; this is shown in Fig. 8, in which the dotted lines represent the diagonals that were ultimately omitted.

The type shown in Fig. 9 soon became standard and prevails at the present time, the number of panels on each side varying from two to four in various constructions. Panels of equal dimensions, Fig. 9, are justifiable for bridge trusses, but are not the best for aeroplane trusses. By varying the width of panels, as shown in Fig. 10, the structure can be made of lighter weight or for the same weight, stronger.

The forces acting in the spars increase from wing top toward the body; it is advisable therefore to decrease the bending buckling length of the spar stations. Also, for the struts and wires the arrangement in Fig. 10 is more advantageous as the forces acting will be more uniform; that is, the extreme struts and wires are loaded more than those in Fig. 9. The members close to the body are loaded less, thus rendering the dimensions of these members more uniform. This advantage of the *variable-panel truss* is not yet fully appreciated, although the arrangement appeared in France five or six years ago.

Then came the *overhang-type biplane*, with its well-known mechanical and aerodynamical advantages. It was introduced by Henry Farman but had already been incorporated in the remarkable triplane model of Stringfellow. It is inconceivable, however, that Stringfellow had the same rea-

*Paper presented at First Aeronautic Session of Society of Automobile Engineers.

†Assistant professor of Mechanical Engineering, in charge of Aeronautical Courses, University of Michigan.

25 Different Designs of Aeroplane Wing Trussing

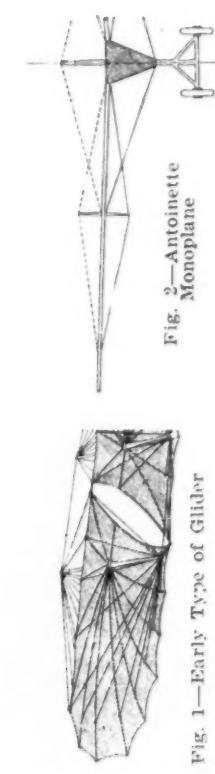


Fig. 1—Early Type of Glider

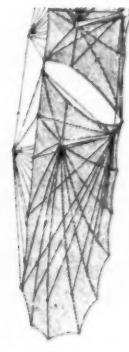


Fig. 3—Bleriot Biplane, Monoplane

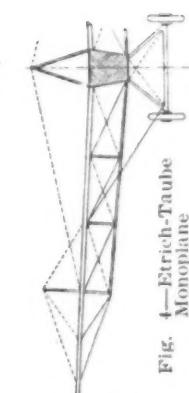


Fig. 4—Antoinette Monoplane

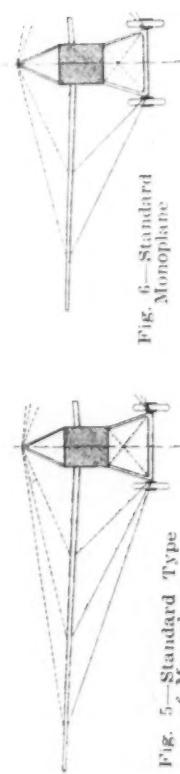


Fig. 5—Standard Type of Monoplane

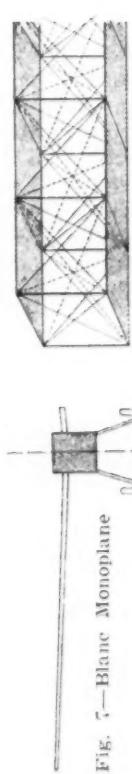


Fig. 6—Standard Monoplane

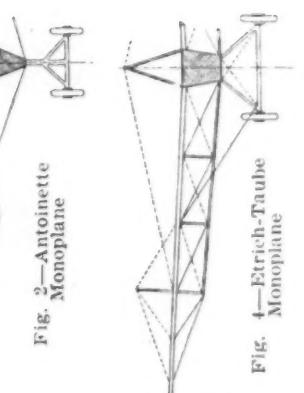


Fig. 7—Blane Monoplane

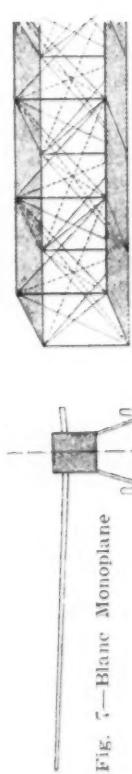


Fig. 8—Early Type of Biplane

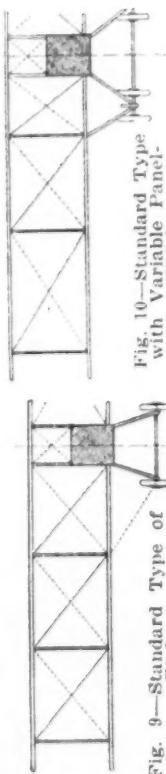


Fig. 9—Standard Type of Biplane

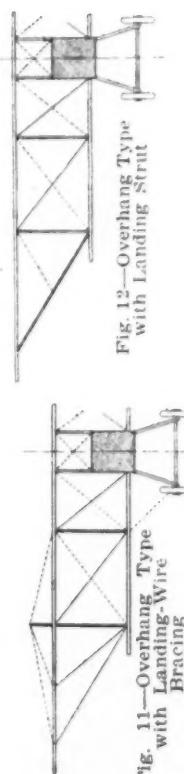


Fig. 10—Standard Type with Variable Panel Width

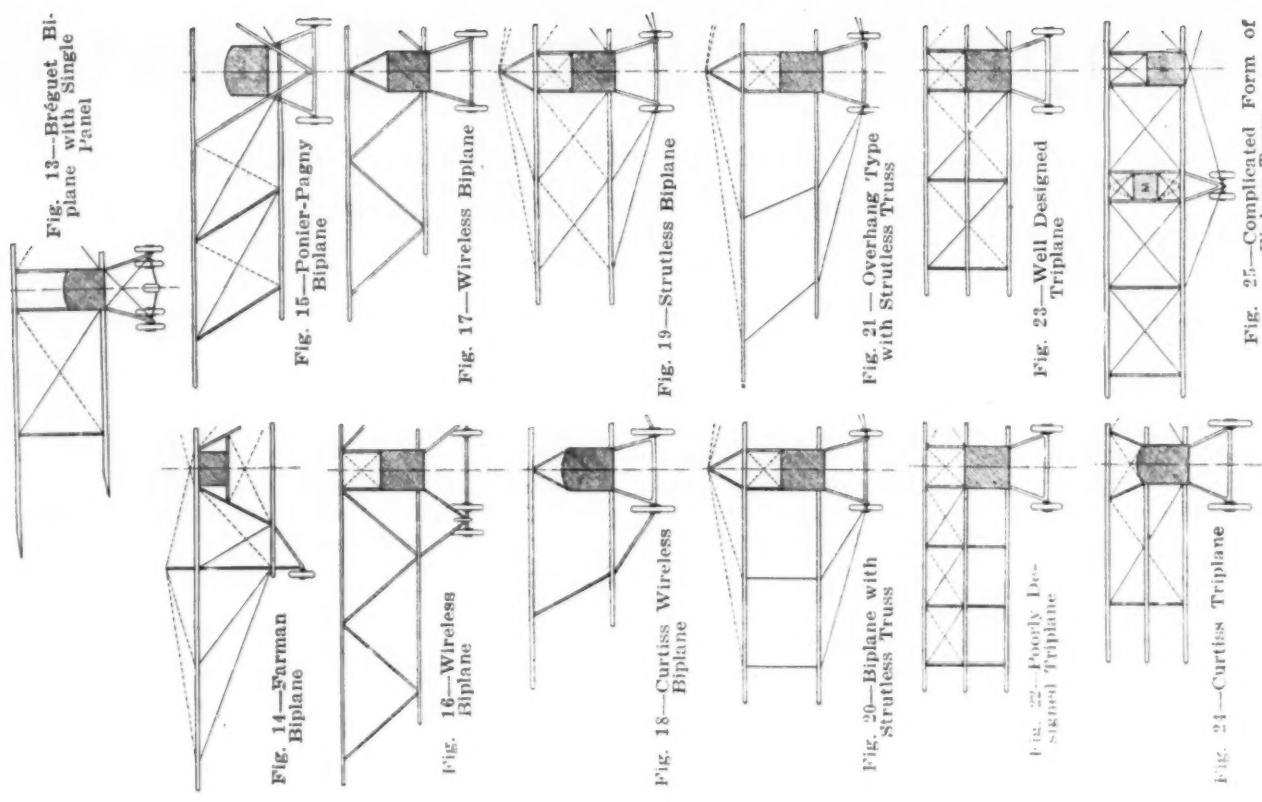


Fig. 11—Overhang Type with Landing-Wire Bracing

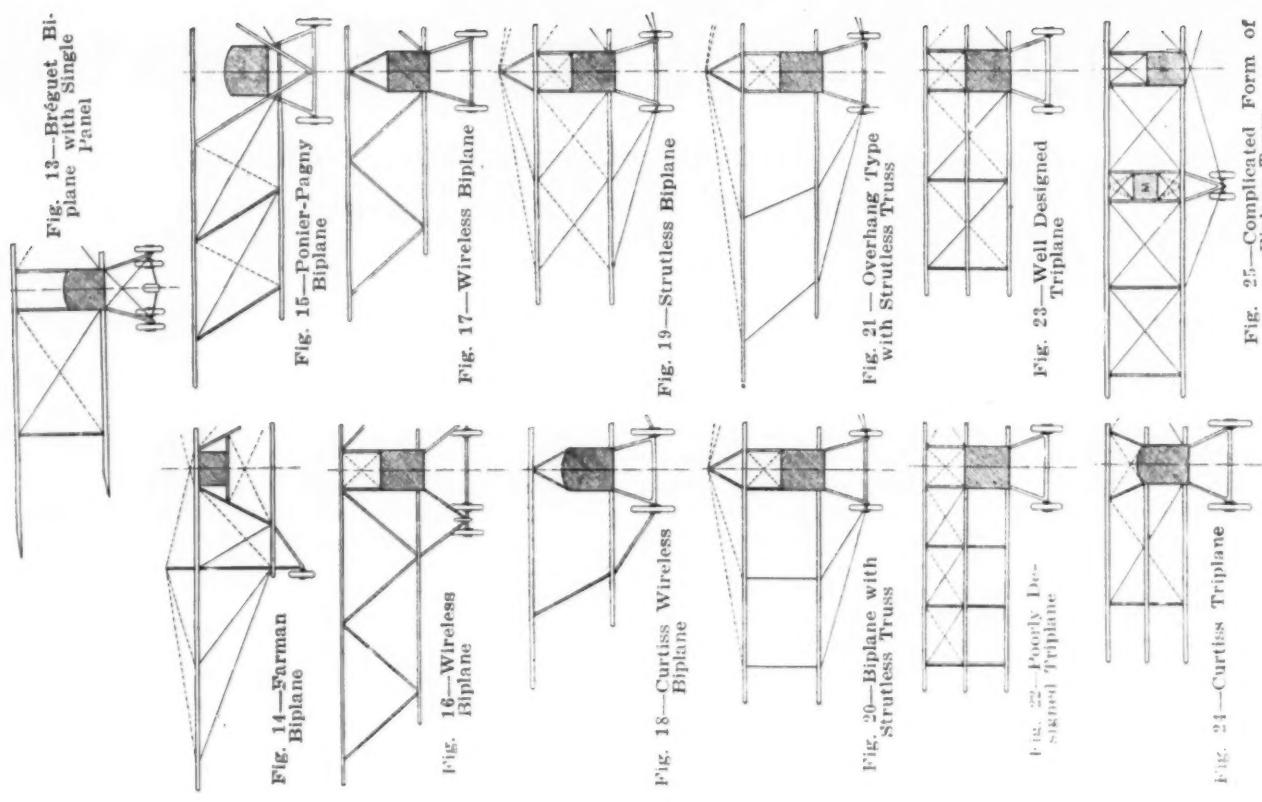


Fig. 12—Overhang Type with Landing Strut

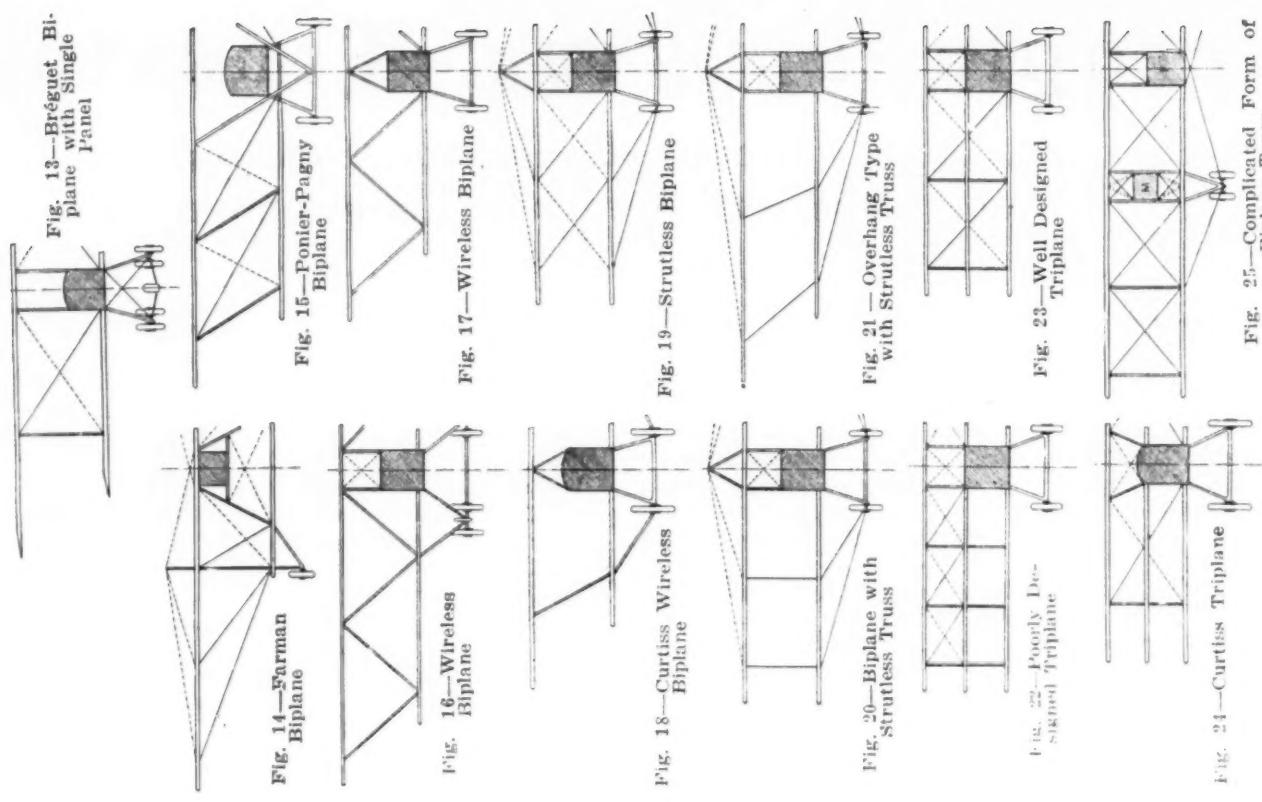
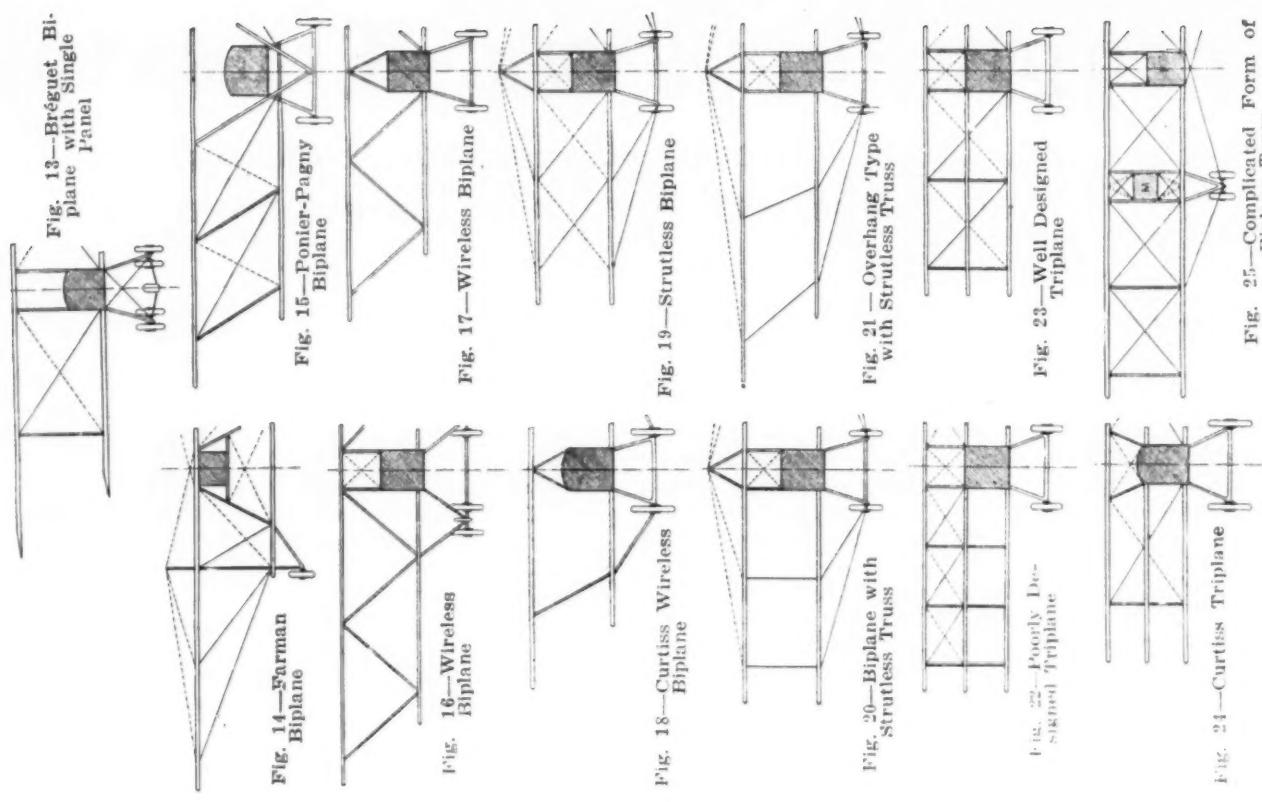


Fig. 14—Farman Biplane

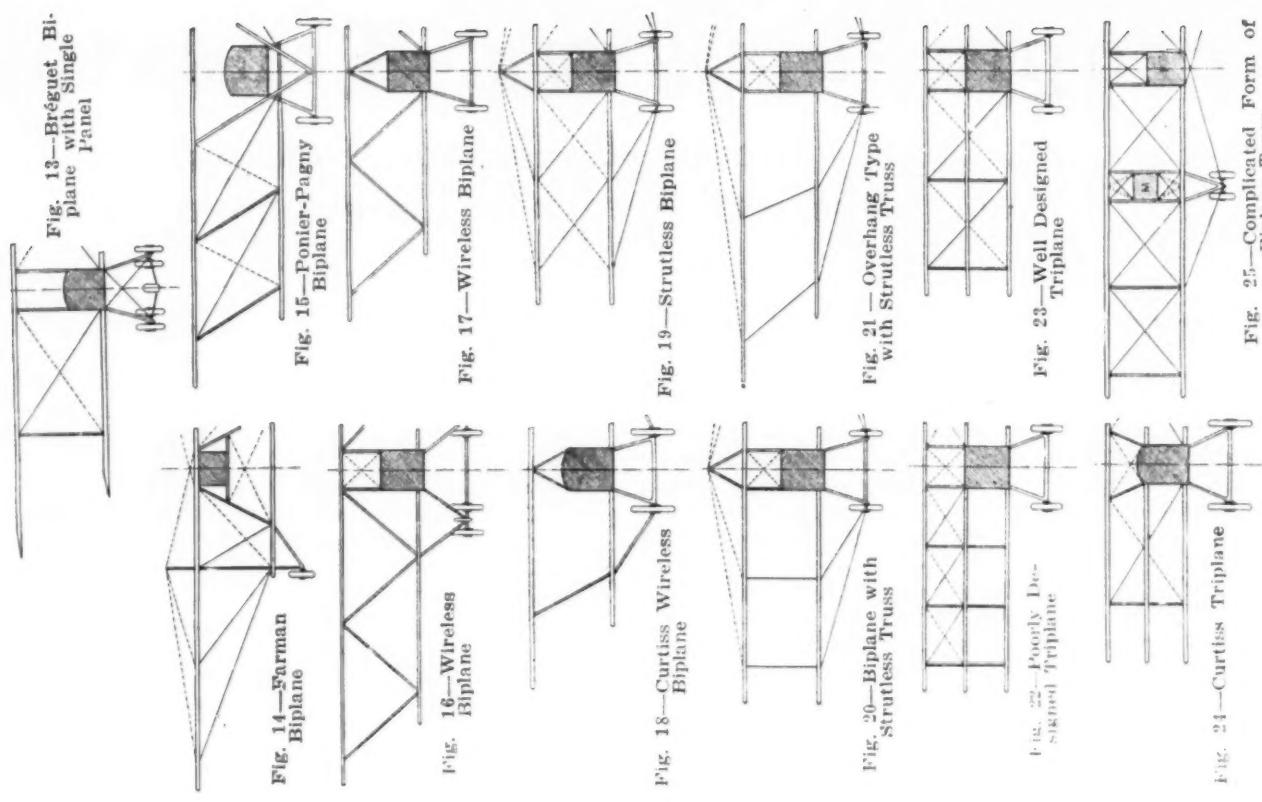


Fig. 15—Ponier-Pagny Biplane

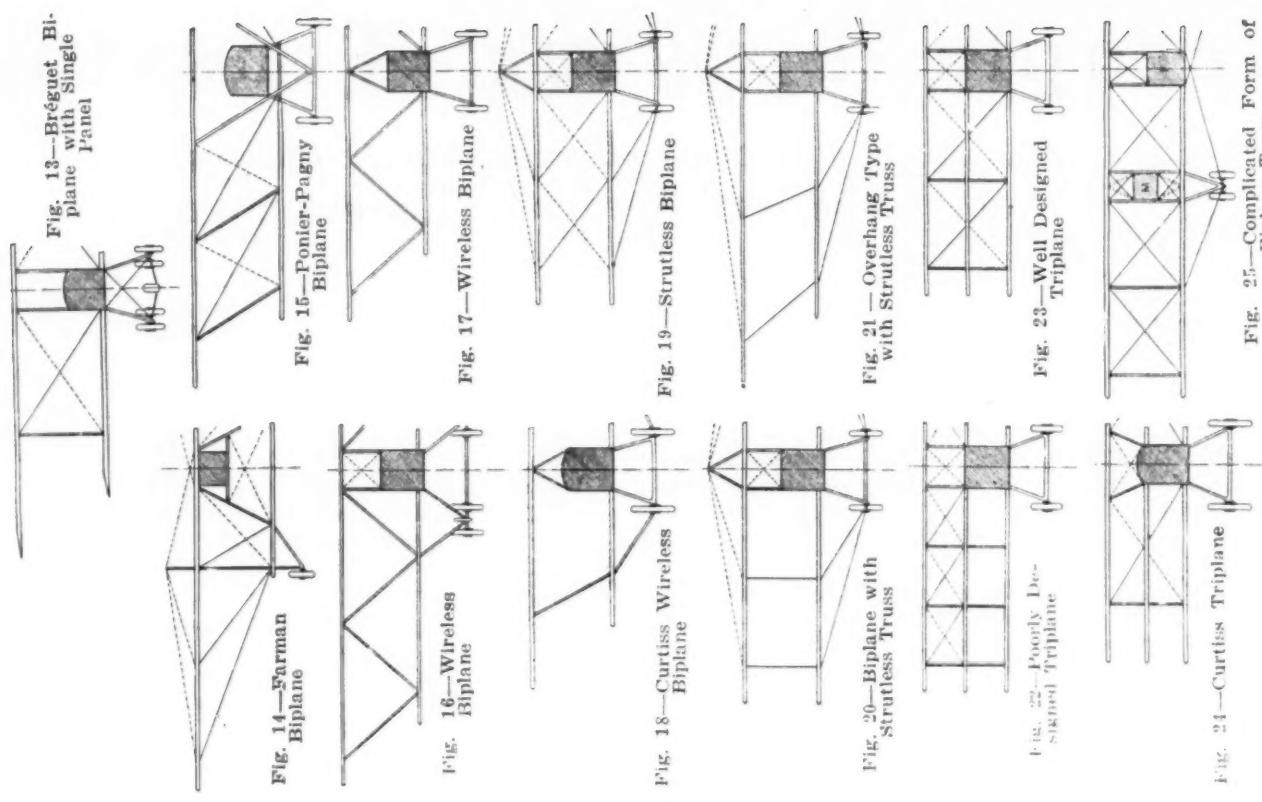


Fig. 16—Wireless Biplane

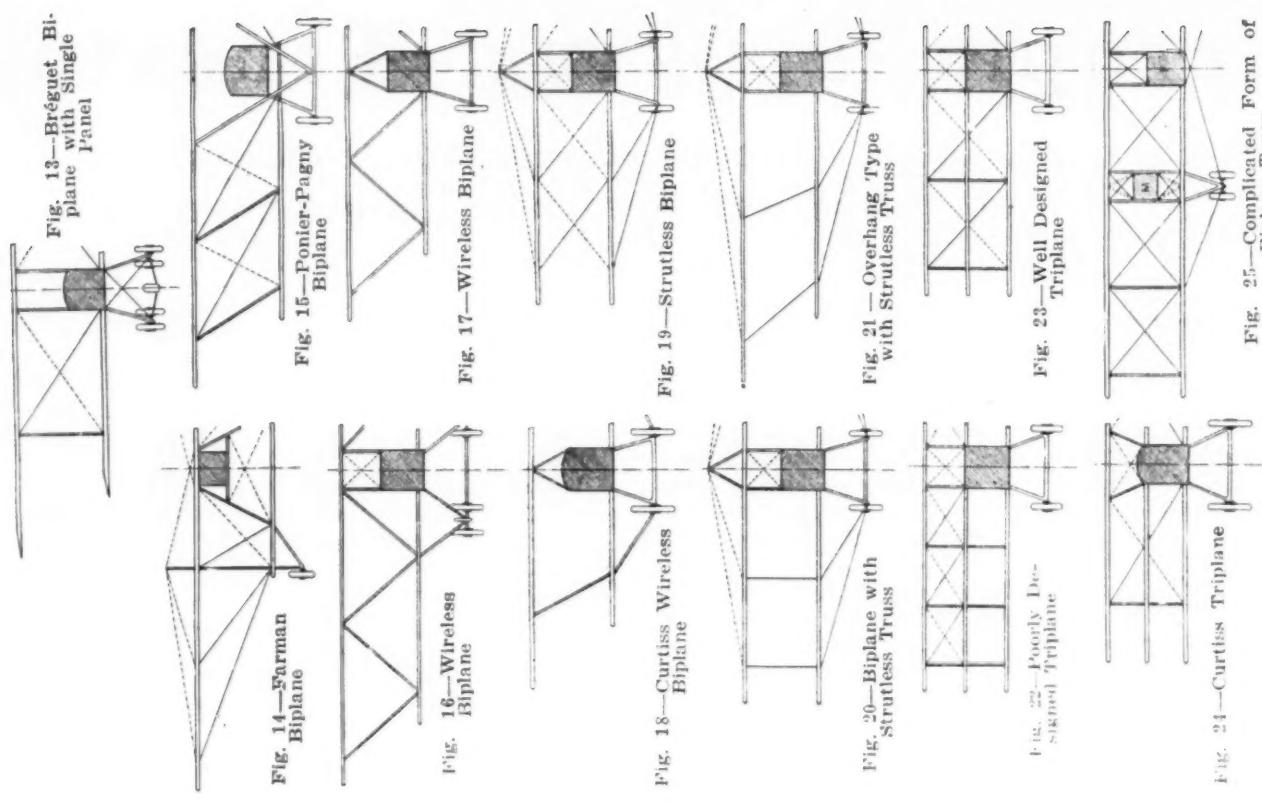


Fig. 17—Wireless Biplane

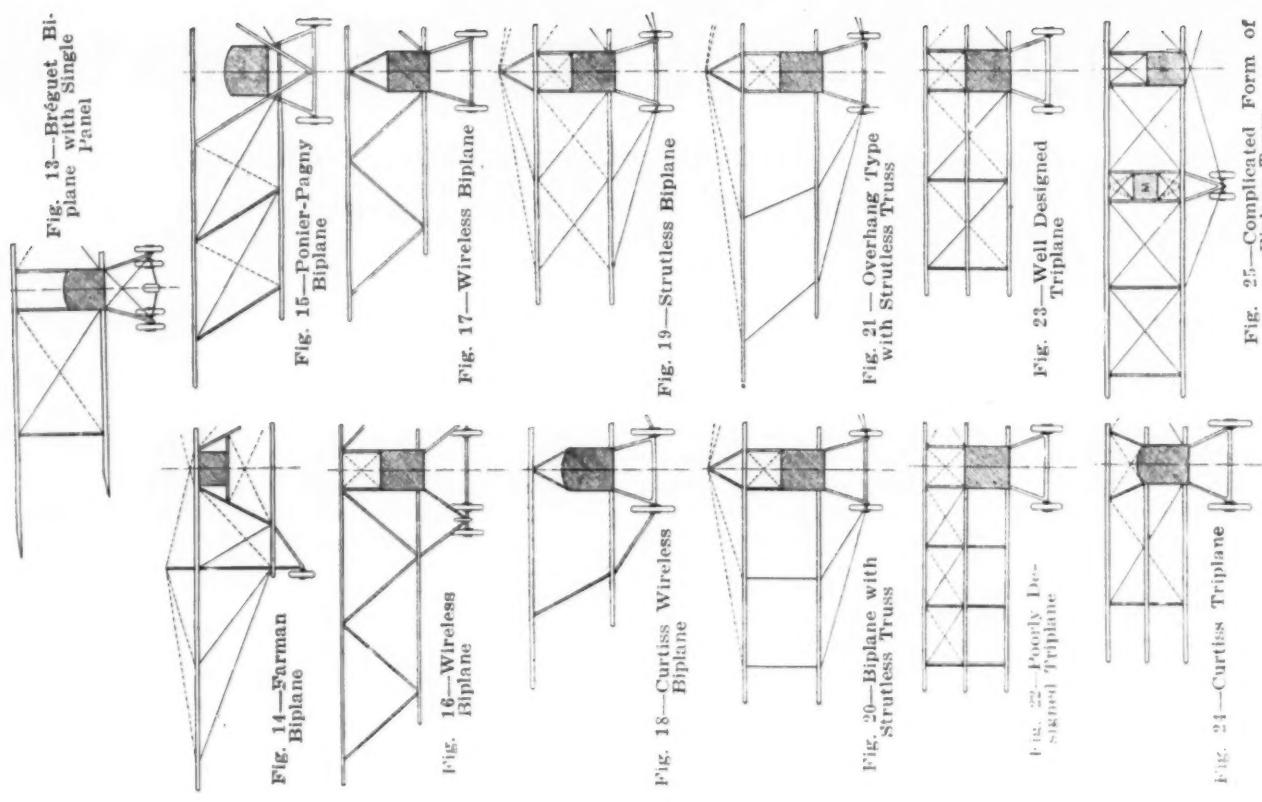


Fig. 18—Curtiss Wireless Biplane

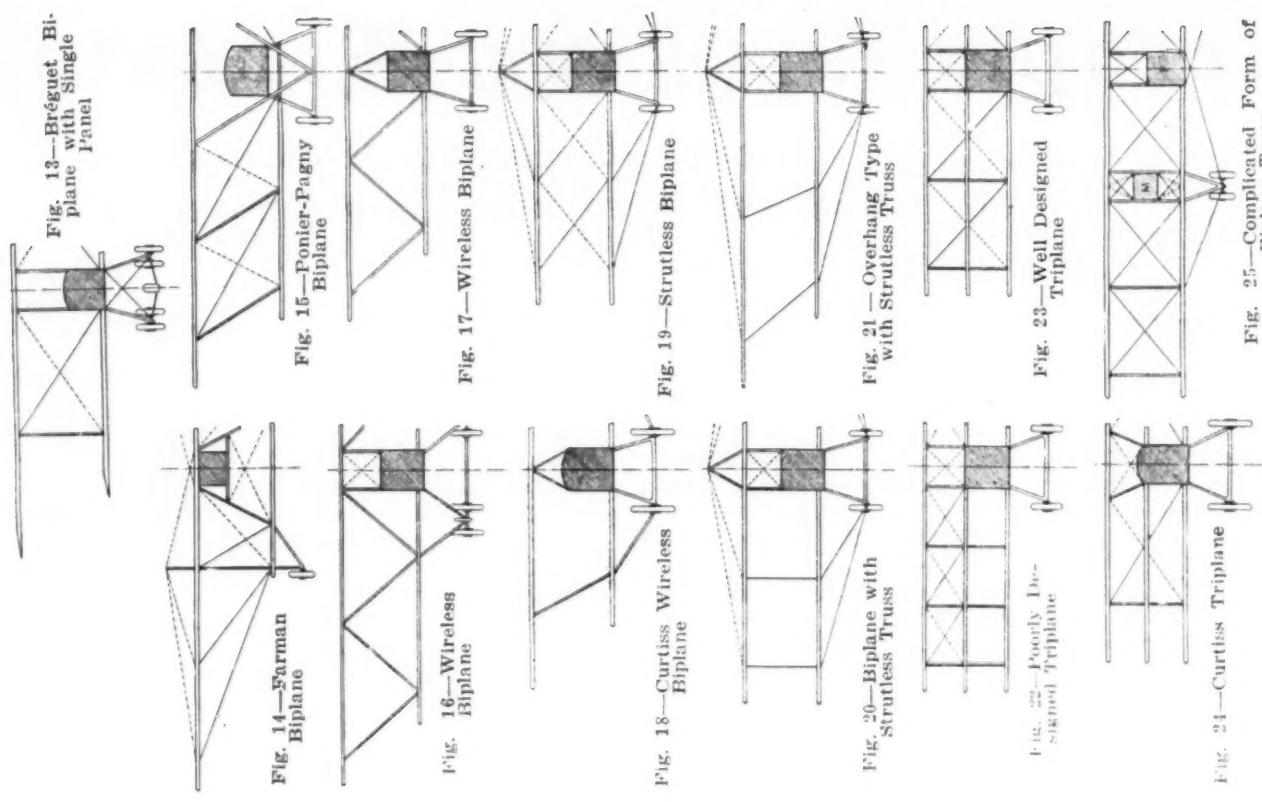


Fig. 19—Strutless Biplane

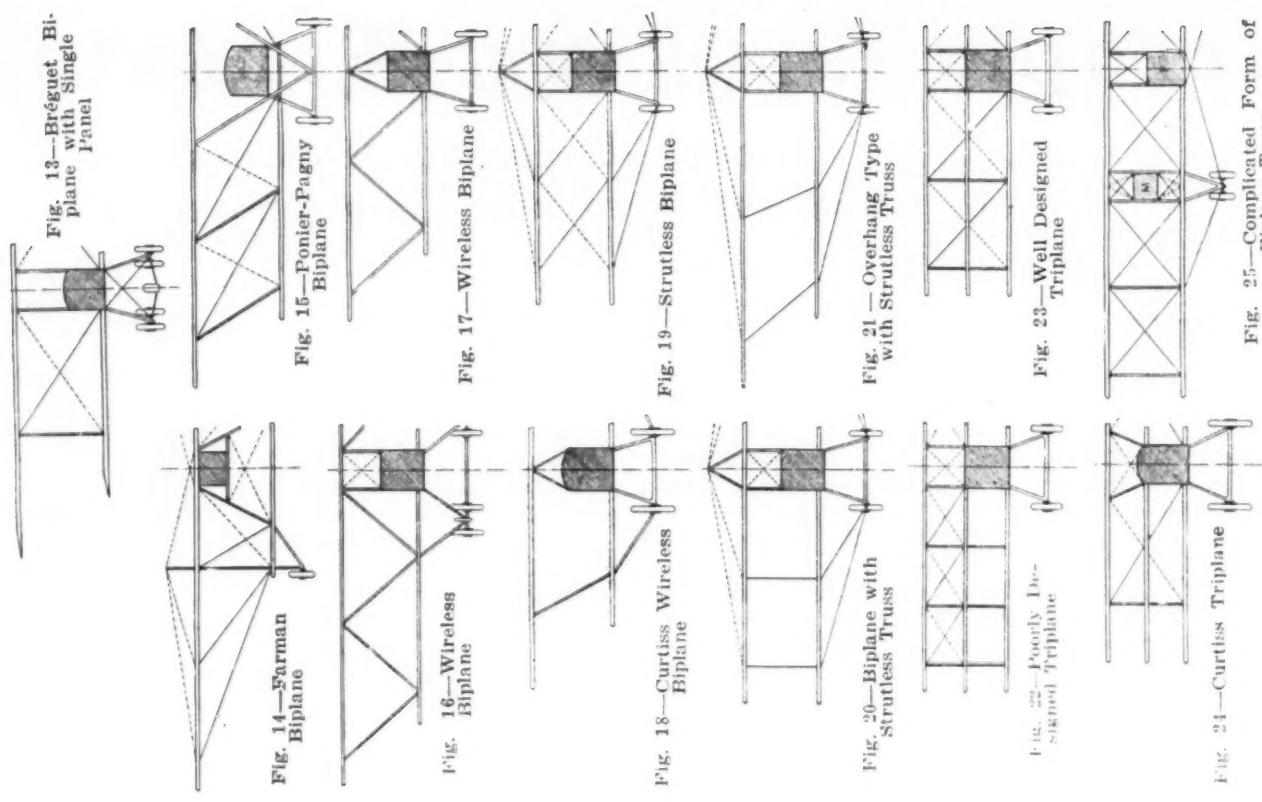


Fig. 20—Biplane with Strutless Truss

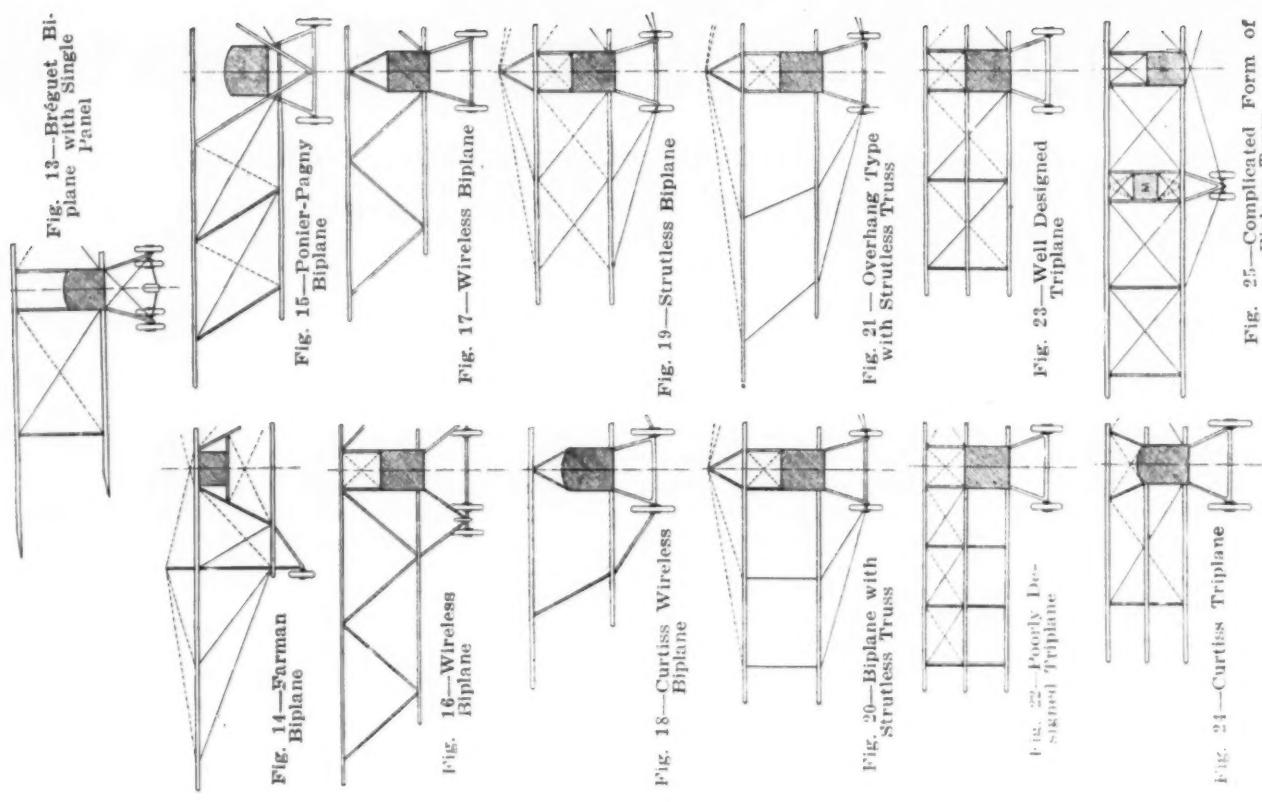


Fig. 21—Overhang Type with Strutless Truss

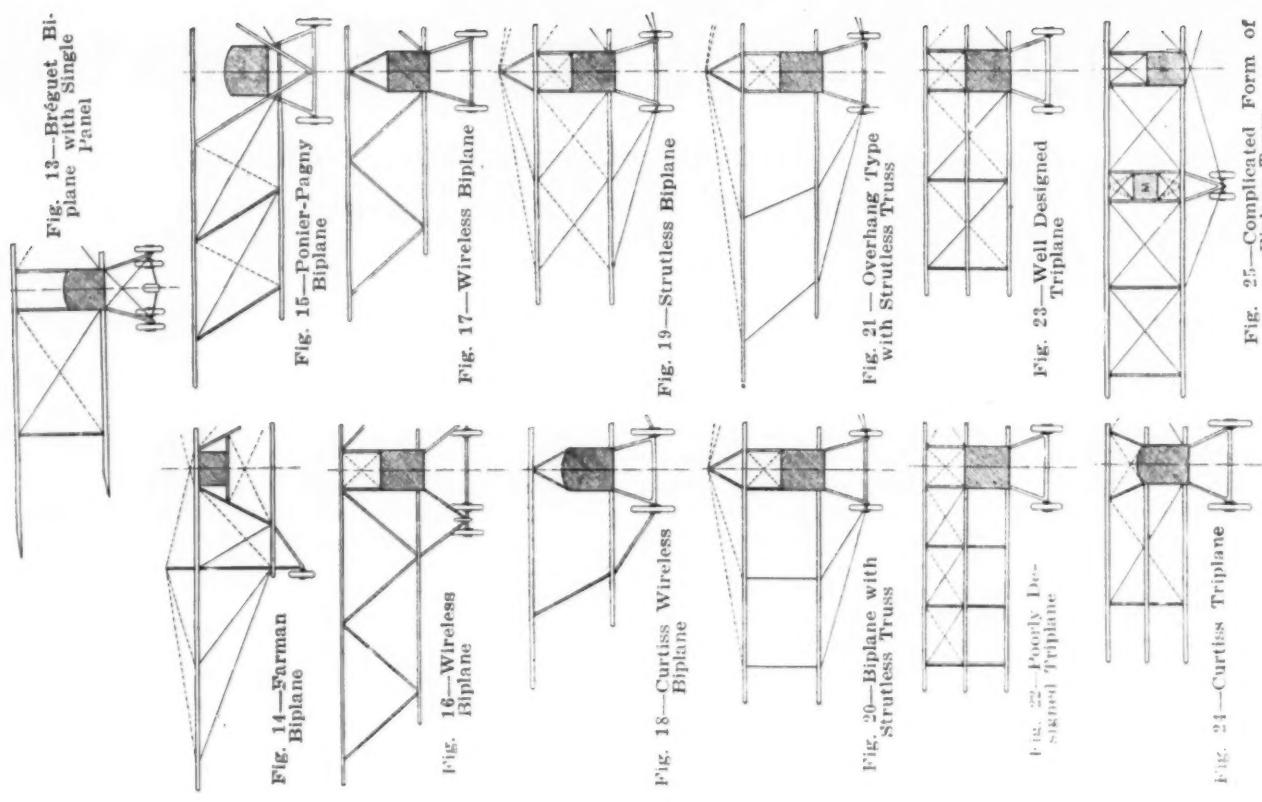


Fig. 22—Poirier Biplane, Standard Triplane

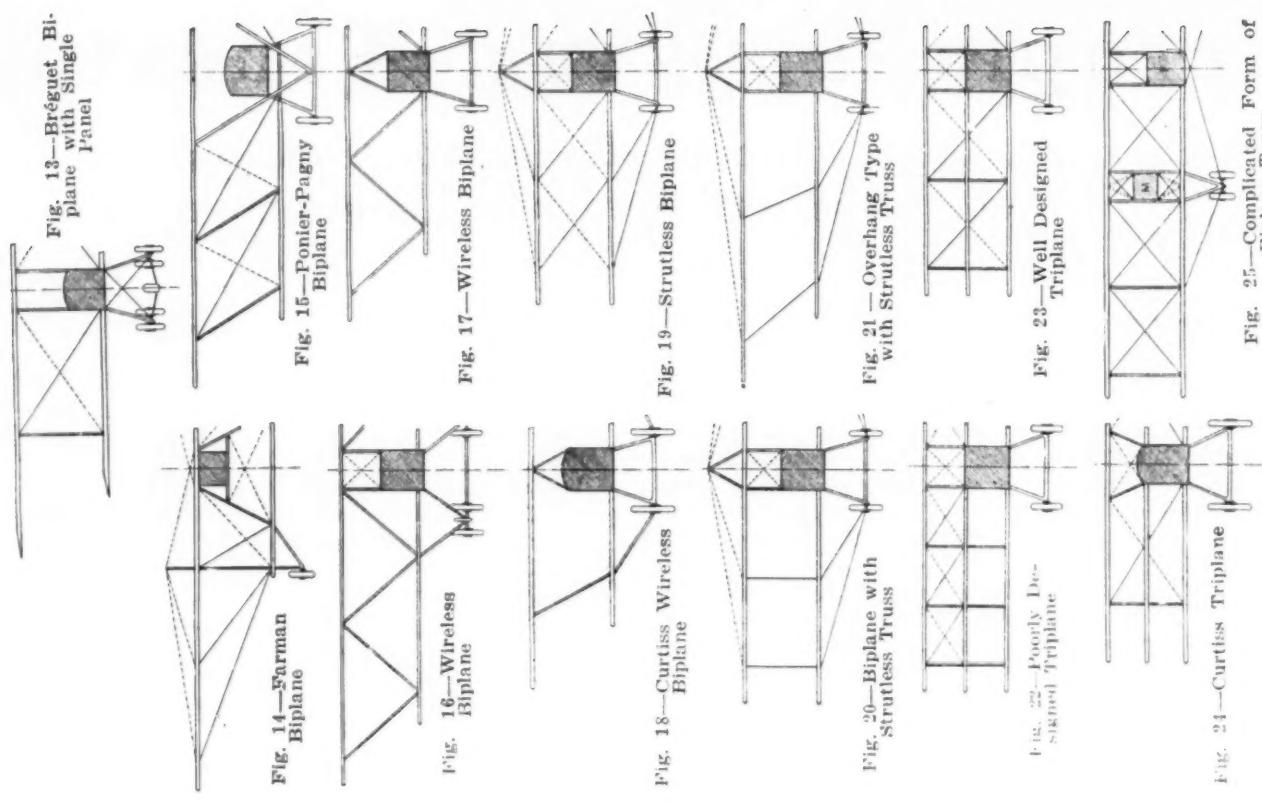


Fig. 23—Well Designed Triplane

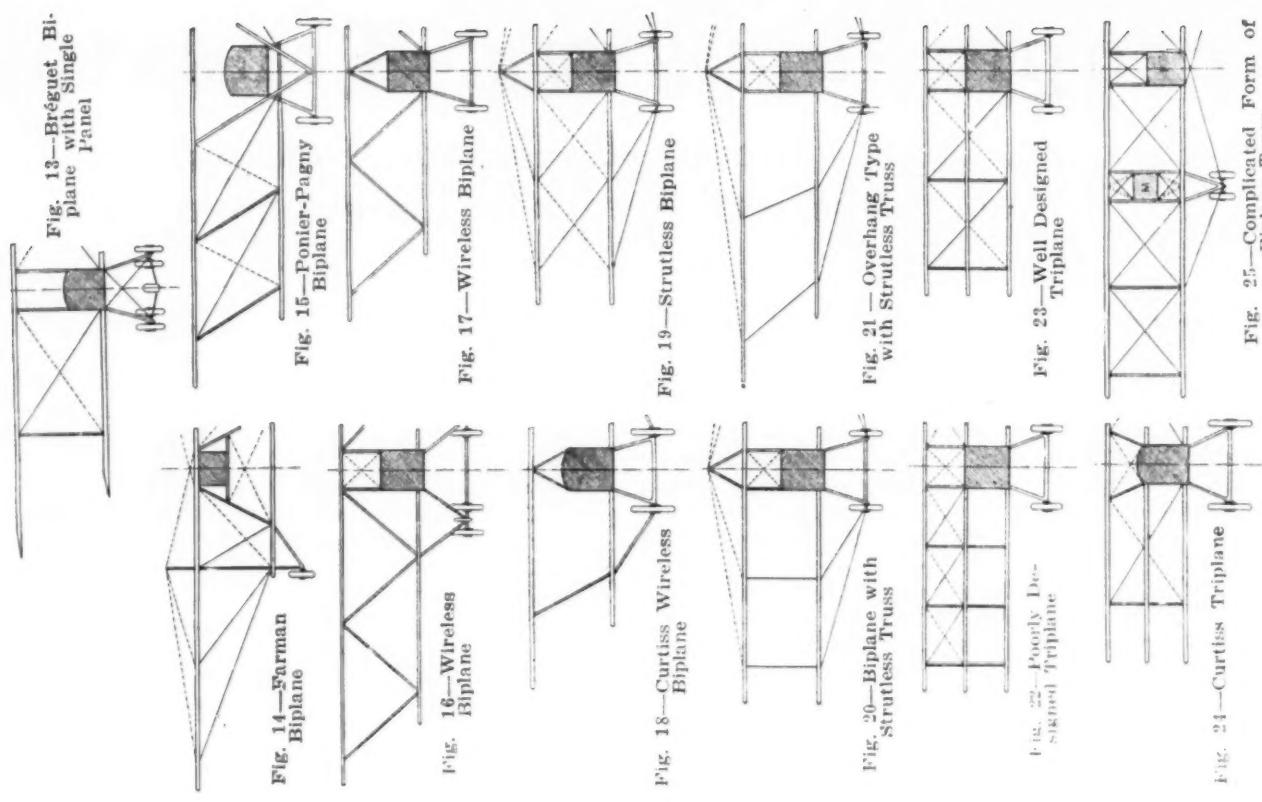


Fig. 24—Curtiss Triplane

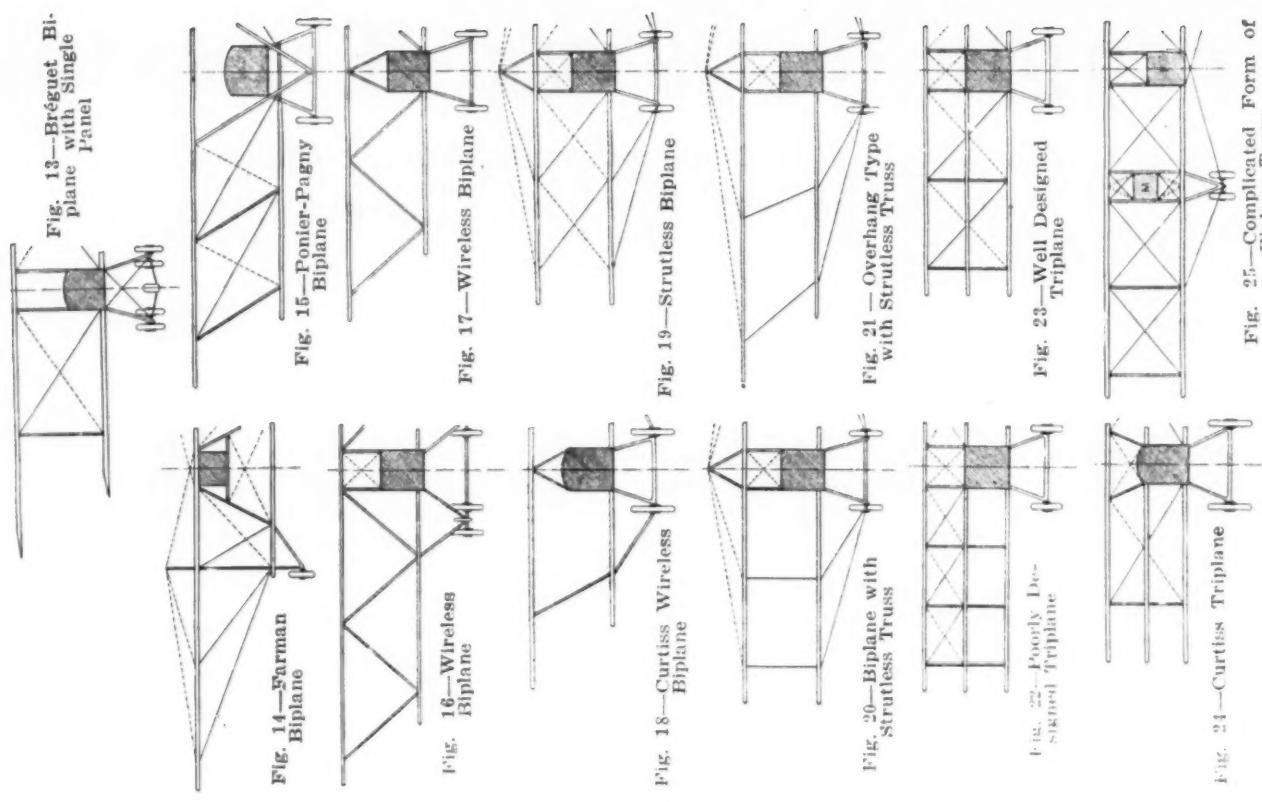


Fig. 25—Complicated Form of Biplane Truss

sons for using overhang as those which influenced Farman. The overhang is treated either with *landing-wire bracing*, Fig. 11, or *landing strut*, Fig. 12, the latter arrangement being more advantageous as it offers less resistance to motion.

The resistance of struts and wires is a considerable part of the total structural resistance and the tendency to minimize the number of such members is therefore justified. An extreme example is one of the Bréguet airplanes, which had one panel 10.5 ft. long on each side of the body, in a machine of 40-ft. span, thus leaving about 8 ft. of free overhang on the upper wing, Fig. 13.

A more radical departure from the typical Pratt truss is displayed by the Henry Farman half-and-half monoplane and biplane machine, Fig. 14. The span of the upper wing is three times greater than that of the lower, so that the airplane is really a biplane (the central part) with two monoplane wings attached at the tips of the upper biplane wing. These machines are still in use in the present war.

The Ponier-Pagny biplane truss, Fig. 15, with equilateral triangles formed by struts and landing wires is a modification of the Pratt truss, as its essential members are the long diagonals of the rhomboidal panels.

Wireless Trusses

The real triangular bridge truss was introduced by the Albatross company in Germany about four years ago. The two examples shown in Figs. 16 and 17 are commonly known as wireless trusses.

The advantage is based on the considerable difference between the resistance coefficients of struts with stream-line sections and of wires or cables, the ratio or coefficient being about one to ten. As the thickness of struts is about ten times greater than the wire diameter, the elimination of landing wires by substituting for the lifting wires members that will transmit forces in compression as well as in tension offers interesting possibilities.

As a matter of fact, the total length of all web members of a wireless truss can easily be made much less than one-half the total length of all wires and struts of the usual truss, so that the resistance of the web members can be reduced almost one-half with a small increase of weight.

With this construction it is difficult to connect the wooden struts to the sockets so as to transmit safely considerable forces in tension; it is also difficult to rectify the structure after it warps. When the wooden spars and struts are eliminated turnbuckles and other adjusting devices are entirely unnecessary; also the difficulty of transmitting forces in tension is avoided, so it is curious why the wireless truss is not popular.

Just recently the Curtiss company has produced an interesting type of wireless truss, Fig. 18, in which the number and length of the exposed members is minimized. The construction is especially adapted to the fast small-span racing or scouting machines.

It is possible to imagine a *strutless truss* as a combination of two pairs of monoplane wings with the usual bracing, Fig. 19, but the total length of wires is considerable, so that the advantages of such a construction would be doubtful. Another form of strutless truss, Fig. 20, is much more promising and with the appearance on the market of wires having stream-line sections, it is possible that the structural resistance can be reduced even further than is the case with the wireless truss. Fig. 21 shows that this construction can be also well adapted for the overhang biplane.

Triplane Trusses

There were and there are few triplanes. The trusses can be treated here along the same principles as the biplane truss.

*The drift-truss, being enclosed by the wing, does not involve aero-dynamical problems, and can be treated in any desirable way from the structural point of view only. A discussion of it is therefore omitted.

I mention the triplane because in several instances the problem has been treated incorrectly, as shown in Fig. 22, in which the full height of the truss is not utilized, although it would increase the strength of the truss about four times. Figs. 23 and 24 show examples of correct treatment. The triplane has a mechanical advantage of decreasing the buckling length of struts by half, which makes them relatively several times stronger.

Fig. 25 shows a more complicated case of biplane truss for large high-power machines. The more uniform distribution of masses along the truss makes it lighter and stronger. (I omit entirely the question of dynamical stability involved in spreading out the masses in this case.) Here also different solutions are possible. In the Sikorski method the engines *M* are placed on top of the lower wing, close to the inner side of the struts. In the French method the engines are put between pairs of straight struts (see the full lines only). In the Curtiss method the engines are fixed between some special crooked struts (see the dotted lines). Each method has some small advantages and disadvantages, which can easily be seen from the figure.

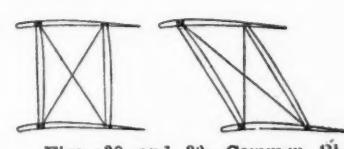
Until now we have considered only the airplane wing-truss as viewed from the front, or the so-called *lift-truss*. Inside the wings, however, are placed the so-called *drift-trusses*.* Both the lift and the drift-trusses are combined to form a rigid three-dimension structure by means of bracing in planes passing through the struts and parallel to the plane of sym-



Fig. 26—Blériot-Bracing



Figs. 27—Etrich-Taube Bracing



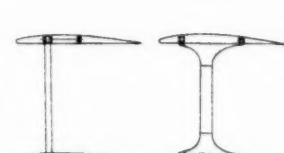
Figs. 28 and 29—Common Triplane Bracing



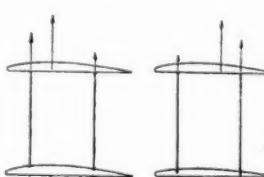
Figs. 30 and 31—N-Type Bracing



Figs. 32 and 33—V-Type Bracing



Figs. 34 and 35—Single Lift-Truss



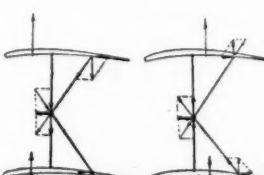
Figs. 36 and 37—Forces in Double Lift-Truss



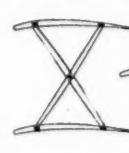
Figs. 38—K-Type Bracing



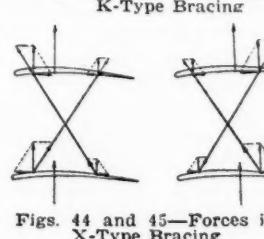
Figs. 39—Curtiss Lift-Truss Strut



Figs. 40 and 41—Forces in K-Type Bracing



Figs. 42 and 43—X-Type Side-Bracing



Figs. 44 and 45—Forces in X-Type Bracing

metry of the whole machine. This bracing is visible in the side view of the airplane and I will call it *side-bracing*.

Side-Bracing Monoplane Wings

The subject of side-bracing of monoplane wings does not offer anything of remarkable interest. Usually each wing has two parallel or slightly converging spars—the front and the rear spar. Each pair of spars, together with some central pylon or the landing chassis, taken as king post, form the front and the rear lift-trusses. Both are fixed in case of aileron control, and the front-truss is fixed and the rear one movable in case of warping. A monoplane has usually a *double lift-trussing*; the spars are at the same time members of both the lift and drift-trusses.

Fig. 26 shows the side-bracing of the Blériot monoplane-bus, on which the rear spar is braced to the lower girder of the *single lift-truss*. This arrangement is more advantageous than the one on the early type of Etrich-Taube (Fig. 27), because the separate lift and drift-truss (requiring three spars) is uneconomical from the mechanical point of view and the two wires offer about twice as much resistance as the single-strut brace in Blériot's construction. The recent type of Taube has side-bracing similar to that shown in Fig. 26.

Side-Bracing Biplane Wings

The side-bracing of biplane wings offers many possibilities of design. The most common types, Figs. 28 and 29, are based on the same principle, but are adapted to the so-called straight and staggered biplane respectively.

The terms "lift-truss" and "drift-truss," although conventional, are not quite correct. None of the trusses takes care of lift or drift alone. Really, the resultant air-reaction upon the wings resolved into components parallel to the planes of the lift and drift-trusses gives the external forces acting on the trusses.

These components differ considerably from the drift and lift, not only in case of a staggered biplane, but also in a straight biplane, in which, for instance, at slow flight and large angle of incidence the forces acting on the drift-truss are frequently opposite in direction to the drift.

Figs. 30 and 31 show the *N-type* side-bracing, with which again the resistance of the wires of the ordinary bracing (Figs. 28 and 29) can be decreased by half. This bracing especially when combined with the wireless lift-truss (Figs. 16 and 17) offers new and interesting possibilities for heavy large-span aeroplanes. It was applied by the Albatross company in the form of a triple lift-truss, which seems to be an unnecessary complication, as simpler combinations are possible.

Fig. 33 shows the *V-type* side-bracing, found in the modern Nieuport scouts. The two converging struts are fixed in a special socket fitted between the spars of the lower wing. This construction is also adaptable to straight biplanes (Fig. 32) but in both cases is especially good for an unequal-chord biplane. Although the trussing in the Nieuport machine is treated as of the double lift type, there is no reason why it (preferably the rear one) could not be treated as a single lift-truss with front struts acting as braces.

Development of Single Lift-Truss

The first single lift-truss was used in one of the first Chanute gliders, which was a quintuplane. Chanute, however, did not seem to appreciate the advantages of the single lift-truss system, as he adopted the double lift-truss for his subsequent machines.

It was Bréguet who (1909) produced and advocated the single lift-truss biplane, his main object, however, being to vary automatically the angle of incidence of the wings, which were hinged to the steel tubular spars (Fig. 34).

A more perfect and elegant construction of the single lift-truss, which can be called *I-type* side-bracing, or simply *I-strut*, was used in Dorner's flying boat (1913). The struts,

Fig. 35, were fixed in sockets having long bases that reached from the front spar to the rear spar and were fixed to the latter. An almost identical construction was adopted in 1914 for the R. A. F. fast scouting machine. Mechanically, the front and rear parts of the socket bases can be considered as a cantilever subject to bending, accordingly as the center of pressure moves forward of or past the center of the strut. The struts are thus subject not only to compression but also to bending. The bending moments, however, in the average-size machine are comparatively small and can easily be taken care of by sockets as well as by the struts. In the latter case it is the maximum moment of inertia of the strut-section that comes into play, and the fibers of material affected are almost idle when buckling occurs. Geometrically and aerodynamically the sockets can be treated as a well-filleted inter-section of a strut of streamline section with half of a stream-line body, thus offering little resistance to motion.

Advantages of Single Lift-Truss

The disadvantage of the single lift-truss system against the double lift-truss is that it cannot be adopted for staggered biplanes, especially those with a pronounced stagger. The advantages however are great and can be demonstrated as follows:

1. The strength of the struts varies as the moment of inertia of the strut section.

At a constant ratio of diameters of the strut section, the least moment of inertia varies as the fourth power of the thickness (small diameter) of the strut.

Therefore, the thickness of strut varies as the fourth root of the load that the strut can stand.

For the double load of a single lift-truss strut against the two struts of a double lift-truss, the increase of the thickness and therefore of the air-resistance will be only about

$$100 (\frac{\sqrt[4]{2}-1}{2}) = 20 \text{ per cent,}$$

or the air-resistance will be reduced by about

$$100 (\frac{2-\sqrt[4]{2}}{2}) = 40 \text{ per cent.}$$

The weights being proportional to the squares of the thickness, the gain in weight of struts of a single lift-truss against a double lift-truss will be about.

$$100 (\frac{2-\sqrt{2}}{2}) = 30 \text{ per cent.}$$

2. The diameters of wires or cables vary as the square root of the load that the wire or cable can stand.

For the double load of one single lift-truss cable against two cables of the double lift-truss, the increase of diameter and therefore of the air-resistance will be about

$$100 (\frac{\sqrt{2}-1}{2}) = 40 \text{ per cent,}$$

or the air-resistance will be reduced by about

$$100 (\frac{2-\sqrt{2}}{2}) = 30 \text{ per cent.}$$

There is no gain in weight however in this case.

3. The larger-size wires and cables of a single lift-truss system allow a further gain in reduction of air resistance by using stream-line form by means of sharp specially-attached trailing edges, which might be impracticable on the small cables of the double lift-truss system.

Forces Acting on Each Truss

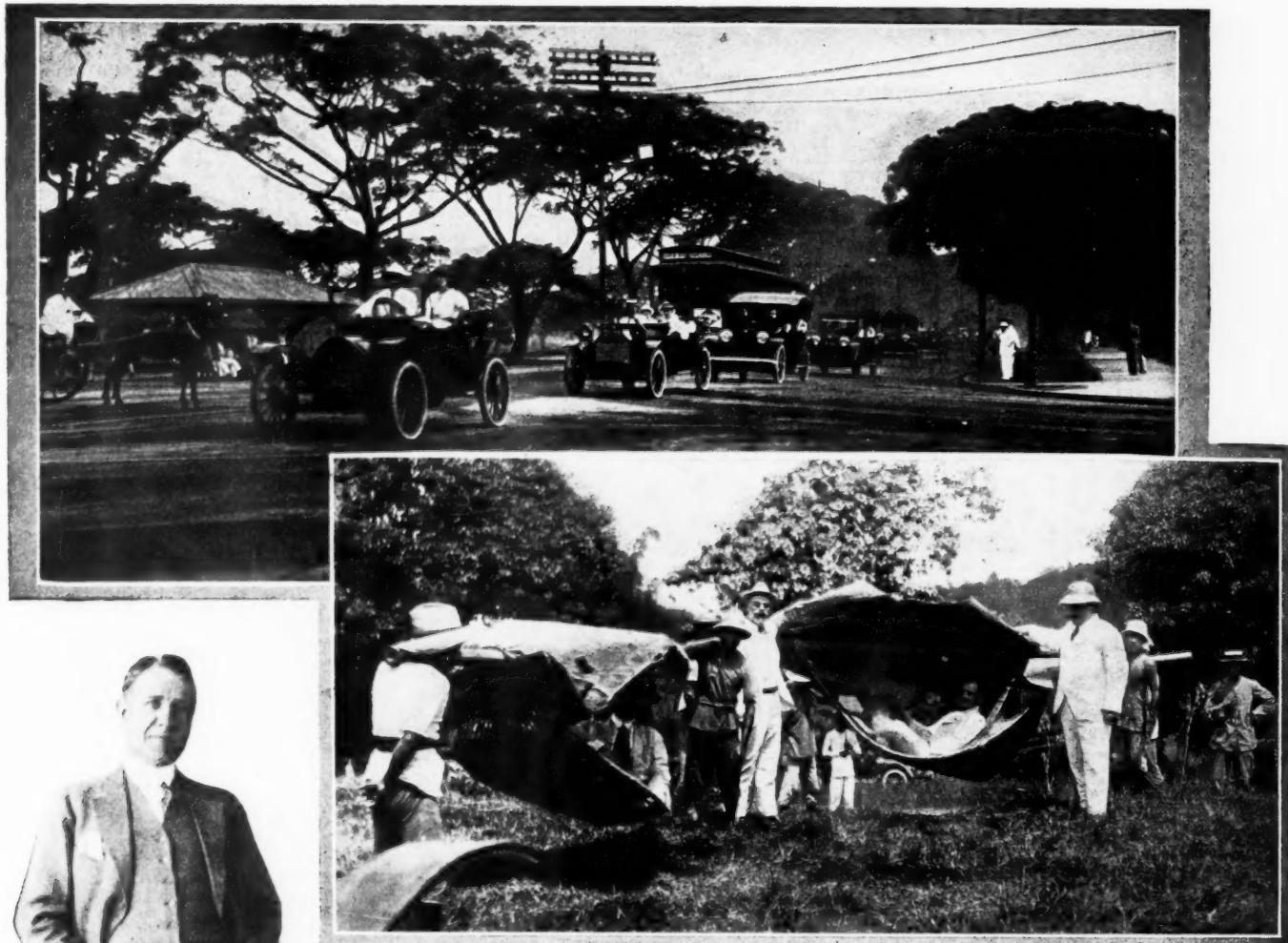
4. In the double lift-truss system the forces acting on each truss depend upon the position of the center of pressure; at fast flight and a small angle of incidence, the rear truss carries a greater part of the total load—roughly speaking between two-thirds and three-fourths of the total (see Fig. 37). At slow flight and large angle of incidence the reverse is the

(Continued on page 389)

Orient a Growing Car Market

Increasing Demand Handicapped by Legal Regulations—
High Freight Rates and Advance Payments by Dealers

By Allen Sinsheimer



THE NEW—Above—Start of Hupmobile parade from Manila to Antipolo, P. I.
THE OLD—Below—Method of traveling by carrying-basket, formerly used in the Philippines

THE chief hindrance to American exportation of automobiles to the Orient, according to G. M. Malcolm, general manager of the Oriental branch of Speyer, Cole & Co., New York, in Singapore, S. S., is the demand for cash in advance which manufacturers make upon foreign dealers. Mr. Malcolm's firm is engaged in the exportation of automobiles and the financing of dealers in Asia. They act as traveling representatives for Hupp, Scripps-Booth, Harroun and Roamer cars and Denby trucks for India, Netherland Indies, Java, Sumatra, Borneo, Burma, Ceylon, Federated Malay States, Siam, Japan, Philippine Islands, Korea, China, French Indo-China and the Straits Settlements, and because of a thorough knowledge of Oriental conditions, have secured a large portion of automobile business for these companies.

Dealers in Asia have constantly been hindered by the cash-in-advance demand. This has caused many American manufacturers a loss of business and has aided Mr. Malcolm to sell the machines under his control. Many dealers sell from twenty to forty cars a month. They are frequently forced to wait for delayed freight shipments. Often it is 2 or 3 months following their outlay

G. M. MALCOLM
General manager Oriental branch
Speyer, Cole & Co., of New York,
in Singapore

of cash in advance before they receive payment for the automobiles from the customers. Consequently they are forced to make cash-in-advance payments upon as many as 120 cars before they receive a return on the expenditure. Speyer, Cole & Co., recognizing the conditions as they prevail, extend financial aid, allowing dealers to pay for cars after delivery, and thus secure business for the cars they handle.

Business throughout the East has been exceedingly prosperous. The Straits Settlements, where tin and rubber are the important products, have been busily engaged supplying nations at war, and the countries where sugar, coffee, tea, tapioca and cocoa are cultivated have had large crops and vast demands for them, which brought financial prosperity, causing an increase in automobile sales.

High-Priced U. S. A. Cars Introduced

The war has effected the introduction of American cars of higher prices. Formerly the natives remarked that Americans could make good low-priced cars but that European makers knew best how to manufacture the higher-priced ones. The war has limited the number of European cars for exportation. Fiat is practically the only European maker selling for export demand, and it is now no uncommon sight to witness several Pierce-Arrow cars in the larger cities. Mr. Malcolm believes that this present opportunity should be seized upon by manufacturers of higher-priced automobiles and that they could eventually build a large market for them throughout Asia.

The cars now predominating are the Ford, Overland, Buick,

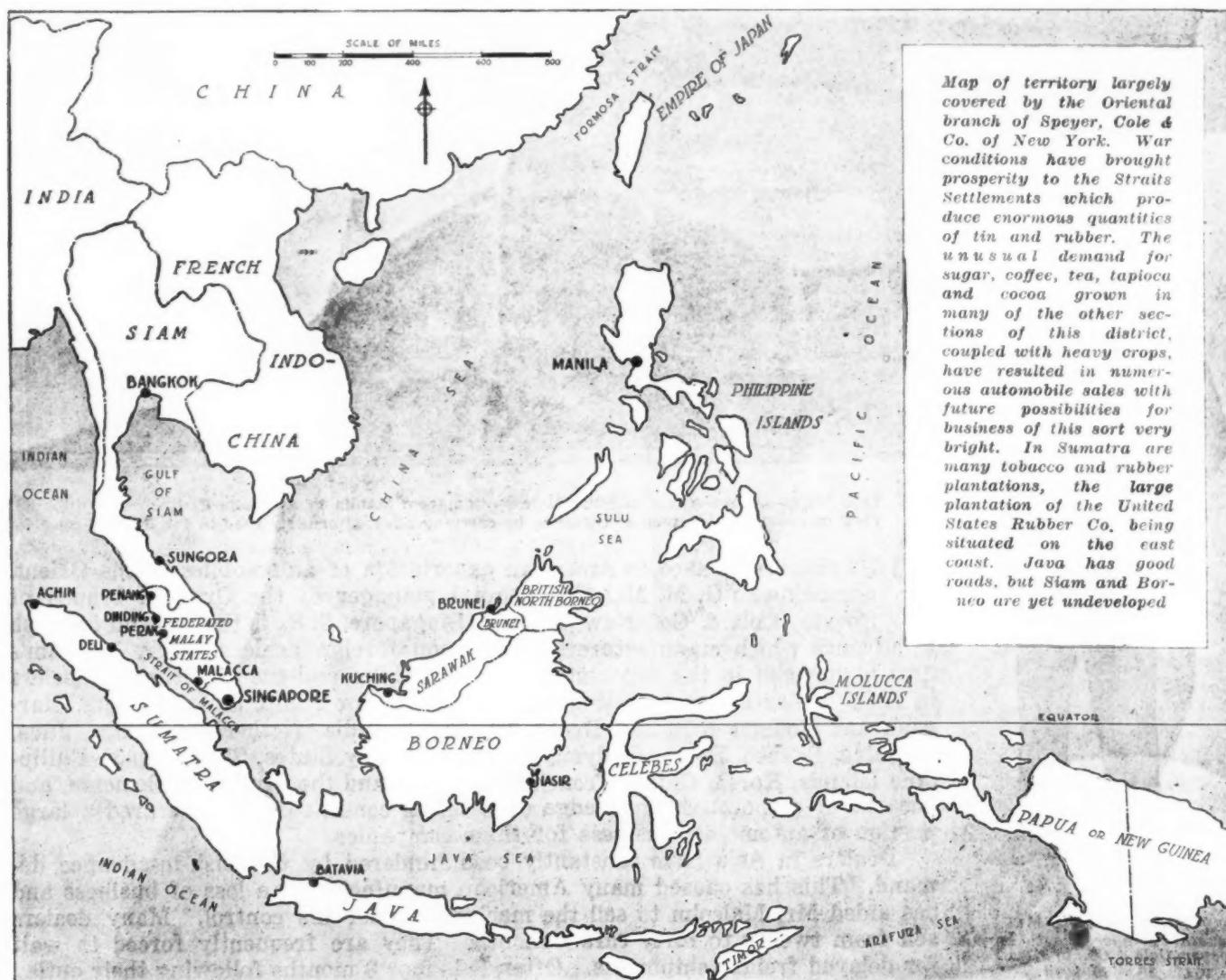
Hupp, Studebaker and Hudson, with Fords in the lead in numbers. At one point between Ipoh and Campur, Mr. Malcolm counted thirty-two Ford cars in a stretch of 32 miles, a number he considered remarkable, as these cities lie on the very end of the Malay peninsula.

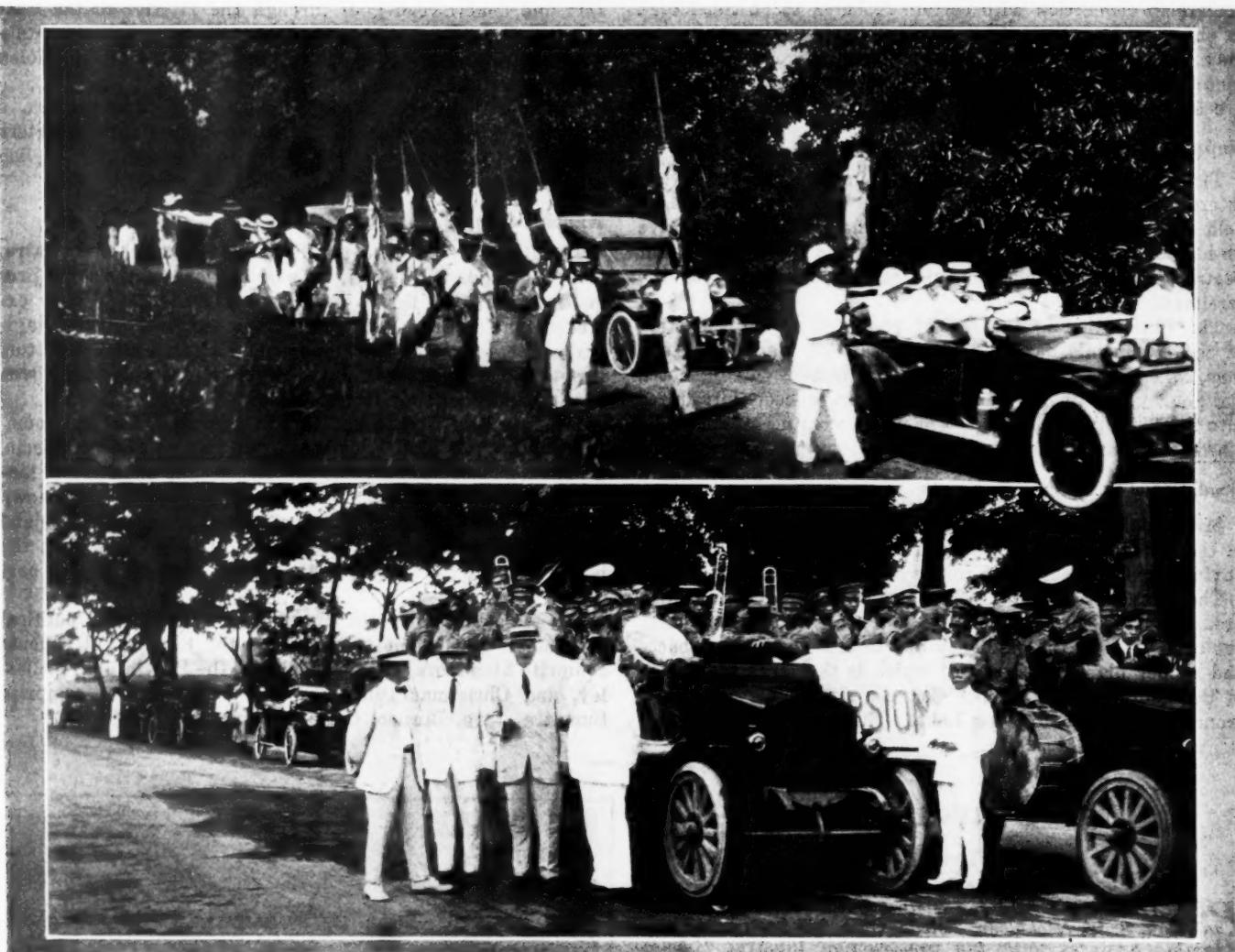
Business increases with good roads. Passable highways are to be found in the Federated Malay States, India, Japan and the Netherland Indies, and the greatest number of cars are discovered there, while the roads of Siam, excepting in Bangkok, and in China are extremely rough and keep automobile sales to a low point. Good road activities have declined since the beginning of the war. Prior to it, the Federated Malay States were engaged in the construction of a number of new highways and that work has been curtailed, while repair and upkeep work which had been maintained throughout India has ceased entirely.

There are a number of strict legal regulations which few American makers follow and this, too, has affected the sale of their products. The Hupp Motor Car Corp., says Mr. Malcolm, has conformed to these regulations and increased its sales by so doing.

Few Heavy Cars

There are a few demands for heavy cars but the general call is for five and seven-passenger cars of lighter build. Few two-passenger cars are used. The salary of the native chauffeur is \$12 a month in gold, and as a consequence everyone can afford a driver and prefers a large car. This low cost for chauffeurs has produced the curious effect of taxi-





Above—Parade of natives carrying pigs roasted for guests of Levy Hermanos, Hupmobile distributors in the Philippines. There were 108 Hupmobiles in line and over 500 guests. Below—Two Denby trucks carrying the U. S. constabulary band of 86 pieces from Manila to Antipolo for the Hupmobile celebration. In the foreground from left to right are: Joseph R. Drake, vice-president Hupp Motor Car Corp.; T. Diehl, general manager for Levy Hermanos; R. S. Cole, Oriental sales manager, Hupp Motor Car Corp.; and Leopold Kahn, proprietor of Levy Hermanos

cab rates at \$1.68 an hour, despite the fact that gasoline costs 40 to 45 cents a gallon, and that tires and accessories sell at prices which are double their cost in the United States.

Michelin and Dunlop tires are the predominating foreign casings in use and the Goodyear, Goodrich and United States form the more important American tires that are seen. All accessories are sold by automobile dealers. There are no retail accessory stores separate from the dealers, and the parts business has been neglected to a great extent because here, too, the makers insist on cash in advance. Few public garages exist. Everyone owns his private garage in conjunction with his home.

Freight rates are exorbitant since the beginning of the war. Boats that formerly charged \$10 per ton of 40 cu. ft. now demand \$30, and as a result have almost doubled the cost of parts and cars. Ford touring cars, which require 7 tons of space, cost \$210 for ocean shipment, and Hupp cars, taking 10 tons, are forced to pay \$300. This does not include freight charges in the United States or from the port of delivery, and the five-passenger Ford sells delivered for \$1,750 in native money or \$890 gold.

The majority of the dealers are Europeans. Many Chinamen serve as sub-dealers and are very honest. They have been found to be inefficient organizers, states Mr. Malcolm, but frequently have more money than the white men. The honesty of the Chinamen, he found, is remarkable, and if it were not for his inability to handle a big deal he would

have no hesitation in making them dealers for his cars.

The streets are not as congested in Asia as in America, but each large city has its regulations and traffic officers. Rickshaws are numerous and interfere greatly with the traffic.

Dealers have not specialized in service as in this country and the average car owner is forced to lay up his machine and await parts from America before he can use it following a material injury.

Truck Business Growing

The truck industry has expanded in recent years. Trucks may be found in use for loading cargoes, doing public department service, hauling for department stores, and even carrying rubber from the innermost sections of the countries to the coasts. None of the nations or countries in which Mr. Malcolm operates are troubled with winter weather, but all suffer from an extreme moisture which affects tires and batteries and probably causes the great demand for magnetos.

Car Dealers Handle Accessories

Accessories are handled by automobile dealers, and there are no separate accessory stores such as exist in the U. S. A.

None of the countries in which Mr. Malcolm travels are troubled by winter weather, but suffer from heavy moisture that affects tires and batteries.

Mr. Malcolm states that many of the demands made by

dealers in connection with certain features to be considered in shipping cars to their territory while in some instances may appear to be foolish requests, have a good reason behind them, and are due to the class of trade to which they are catering.

Hupmobile Day

THE AUTOMOBILE is able to present in this issue some very interesting illustrations in connection with Hupmobile Day held in Manila, P. I., on June 25. These photographs give an idea of both city and country roads, and to a great extent portray road conditions as existing throughout all of the territory.

The illustration at the top of page 385 shows the start of the Hupmobile parade from the City of Manila to Antipolo, where the celebration was held, and it will be noted the four types of Hupmobiles which have been introduced into the Philippines during recent years, viz.: model 20, model 32, model K and model N are shown in order.

Good Roads in India

Mr. Malcolm is particularly familiar with road conditions in the different parts of his territory. He reports India as having good and extensive road systems.

The Island of Sumatra, which approximates California in area, with 150,000 sq. miles, has fine roads in the Northeast out of Delhi. In the residency of the east coast are tobacco and rubber plantations, one of which is the large plantation of the United States Rubber Co. An automobile can travel from Medan south to Toba Lake. The lake is crossed by a

raft and a new road goes through the interior to the west coast at Padang. In this way a car can cover approximately one half the island. There are good roads from Ben Kolen to the interior.

In Siam there are no roads excepting around Bangkok, a city of 700,000 population. Rice constitutes three-quarters of the total produced in Siam, which is, of course, an English settlement.

Kapok Among Java Products

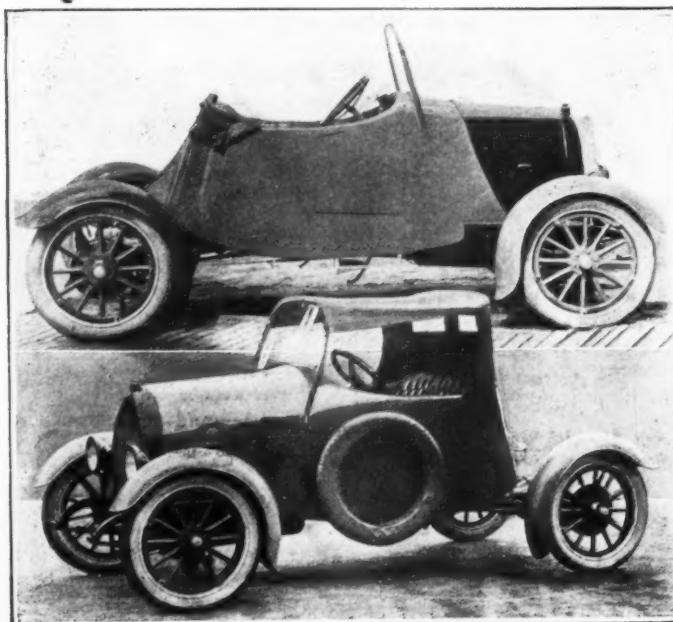
The island of Java, about a quarter the size of Sumatra, has good roads and is reputed as being one of the most productive islands in the world. Last year its sugar crop exceeded that of Cuba. Its other crops are rice, tobacco, tapioca, coffee, tea, cocoa and cinnamon. Kapok, a kind of cotton, is obtained from trees in Java. This cotton cannot be woven but it is used in automobile cushions.

The island of Borneo has very few roads. You can sometimes drive 5 or 6 miles out of such a city as Bandjermassin, a place of 50,000 population. In Borneo the commercial language is Malay. The natives, or dyaks, are the well-known wild men of the island. Some of the products of the island are rubber, rattan and diamonds. From the coast back the island is swampy. There are large oil deposits on the east coast.

Mr. Malcolm gave some conception of the various political divisions. Thus what is known as the Straits Settlements comprise Singapore, Penang, Malacca, the Province of Wellesley, and Christmas Dindings. Netherland Indies comprise Sumatra, Java, Borneo, Celebes, Sondea and Molucca.

An Unusual Body Design

REALIZING the field for custom built bodies of original design, S. W. Nicholson, Toledo, Ohio, has been doing considerable business with the construction illustrated below during the past year. These bodies, which are made under the name Custom-Built, are fitted to standard chassis, the illustration showing one on the Overland 75. The entire assembly, consisting of radiator, hood, body, fenders, etc., is designed to harmonize with the aim of imparting personality and distinction to the finished car. The manufacturer makes a feature of the low cost of building up cars with the equipment, the price quoted for the car illustrated herewith being under \$1,000.



Wilson Truck Wheel Puller

THE novel form of wheel puller, operation of which is illustrated above, is a feature of the Wilson trucks, built by the J. C. Wilson Co., Detroit.

The operation illustrated consists of removing the three bolts holding the hub cap to the hub flange, unscrewing the dust plate in the end of the cap, removing the large nut securing the rear wheel to the axle spindle and again attaching the hub cap with the three bolts. Any 1-in., 9-thread bolt is inserted in the hub cap and screwed against the axle end until the wheel slips off.

Old and New Transmissions

Comparing Original Panhard and Renault Gearsets with Modern Types of Unconventional Sort

IT is rather a habit with the authors of papers to be presented before engineering societies to review a whole subject historically, practically writing a small text book upon it. A very interesting paper of this class was recently presented to the British Institution of Mechanical Engineers by Robert E. Phillips. The paper is a very long one and deals briefly with almost every kind of motor vehicle transmission. The illustrations which accompany it are interesting, showing the variations possible in detail without greatly altering the principle.

The author, after reviewing the unmechanical features of the conventional sliding gear transmission, describes the original Panhard and Renault transmissions. The first named was the original sliding gear and the second, the first sliding gear with a direct drive on high. These are shown diagrammatically in Figs. 1 and 2, in this case, as in all the other illustrations, *A* being the driving shaft and *B* the driven shaft. The only sliding member in this gear was the sleeve or lower driving shaft carrying four gears. As shown, the lowest speed is in use. Drawing back the sleeve engages the second gear, further movement gives a neutral position and thereafter follow the engagements of the third and fourth ratios. In the original design there were two bevel pinions on the shaft *B*, both in mesh with the ring gear through which the cam-shaft and the side chains were driven. Between these bevel gears was a dog clutch and a separate lever enabled this to be engaged with either of the bevel pinions so giving four speeds forward and the same four speeds reversed. Panhard subsequently eliminated this second lever and arranged a reverse pinion somewhat after the fashion of the modern type.

The Renault gear was a considerable advance, although quite complicated. There was a central shaft divided some-

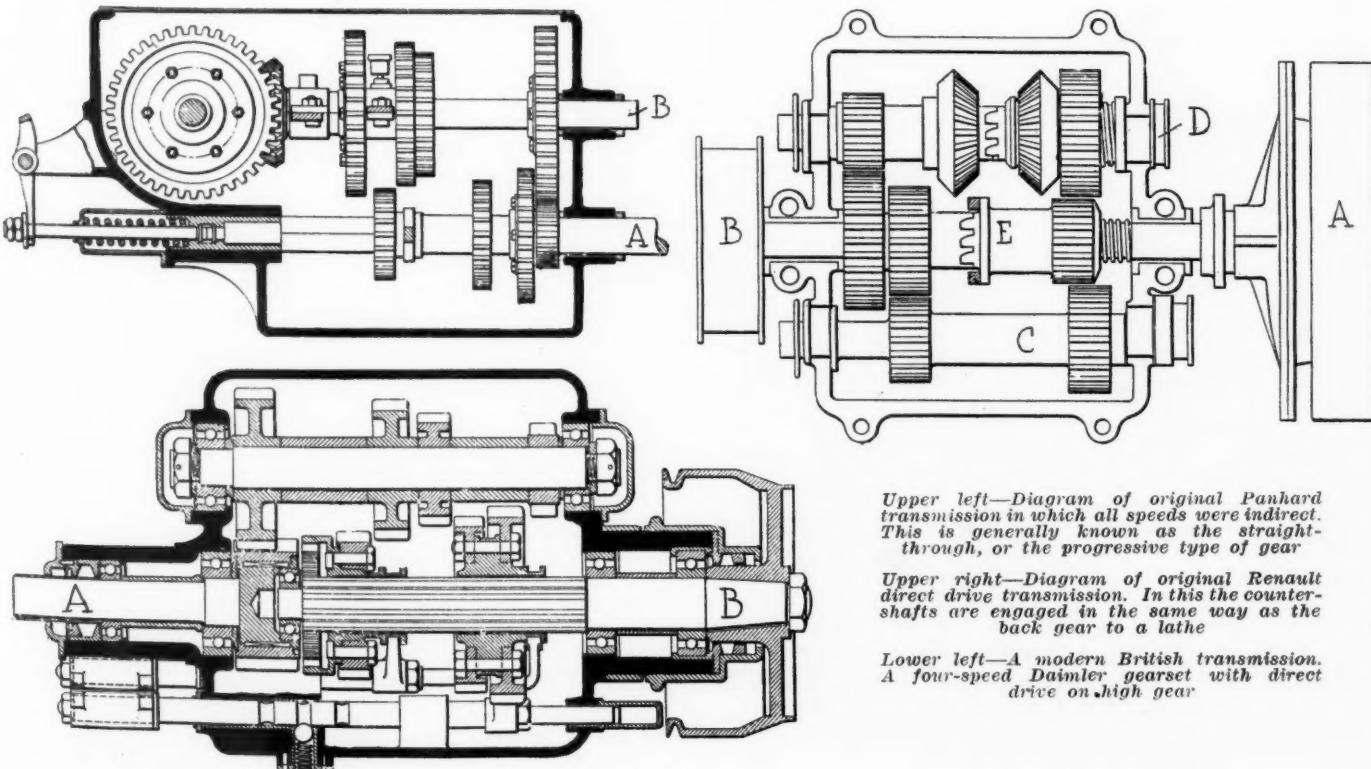
where near the middle. That is to say, the part *A* and the part *B* were independent just as they are in the modern gearset. The sleeve *E* comprised a jaw clutch at the left end, a gear pinion at the right end and behind it was a spring to keep the jaw clutch engaged with the other member which was part of shaft *B*, and, of course, solid with the two pinions at the left end. With *A* and *B* clutched together in this way we have the direct drive and to obtain any other drive the first movement of the control lever opens the clutch holding it open against the pressure in the spring.

Shafts *C* and *D* are mounted on eccentric bushings, these being interconnected so that either shaft can be rolled towards or away from the middle shaft just like the back gear of a lathe. When clutch *E* is disengaged and shaft *C* is rolled over so that the gears on it mesh with the gears on *A* and *B*, the drive passes from *A* through *C* as a countershaft and so to *B* just as in a sliding transmission. Similarly keeping *C* out of mesh shaft *D* can be swung around giving a different gear reduction.

The object of the two bevels seen on *D* is to provide a reverse. The bevels are each integral with the spur gears lying behind them and they are free to rotate on the shaft *D*. Normally they are held together by a jaw clutch between them which is kept engaged by a spring seen at the right end. Under these conditions the set of gearing on shaft *D* provides the low gear.

Mounted separately in the box is a third bevel, pinion, not shown, which can be forced forward so as to mesh with both the bevels on *D*, and in meshing it pushes them apart so disengaging the clutch. This causes the left bevel to revolve in the opposite direction and so provides the reverse gear.

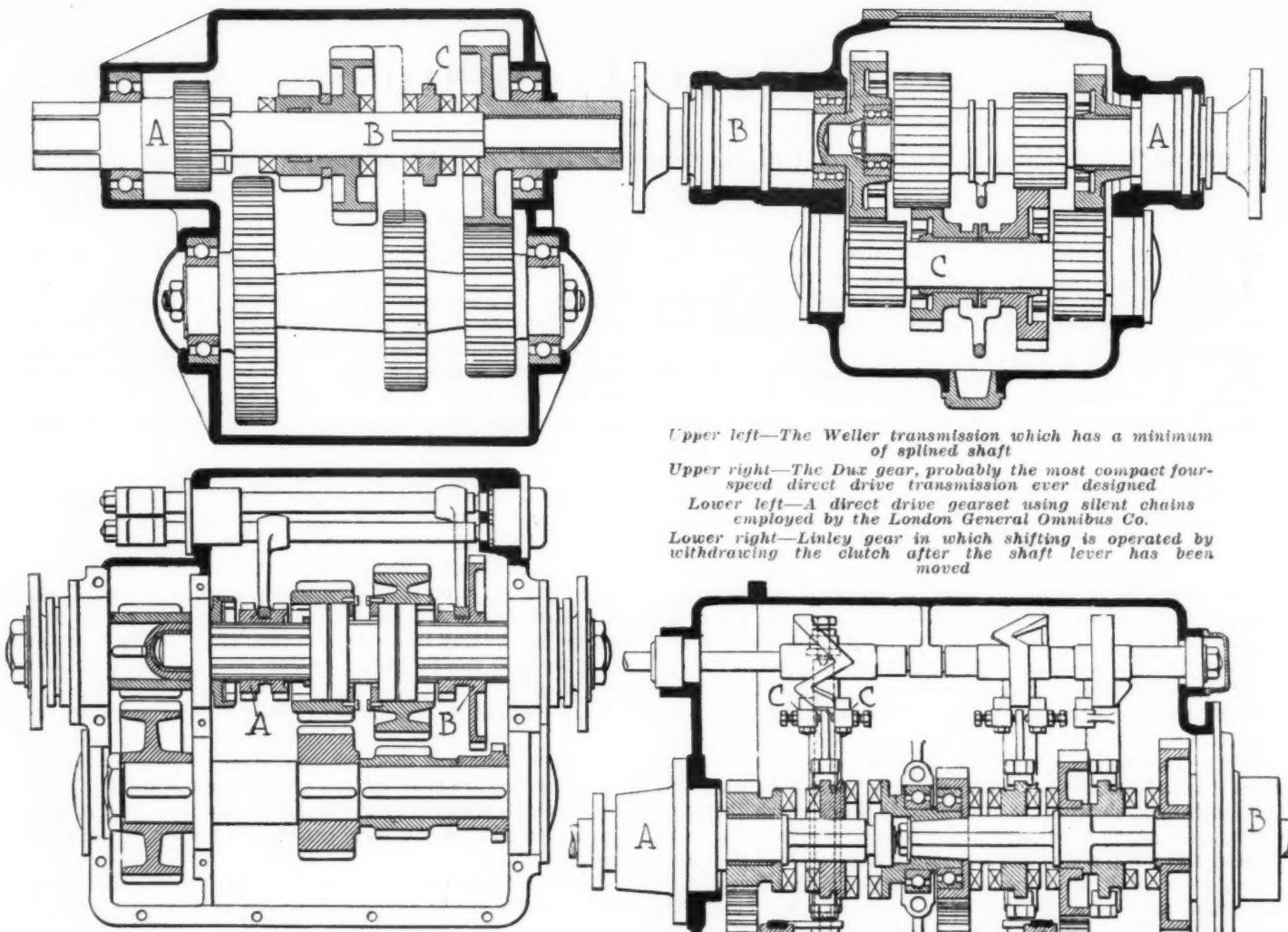
Compared with the conventional transmission, this seems a



Upper left—Diagram of original Panhard transmission in which all speeds were indirect. This is generally known as the straight-through, or the progressive type of gear

Upper right—Diagram of original Renault direct drive transmission. In this the countershafts are engaged in the same way as the back gear to a lathe

Lower left—A modern British transmission. A four-speed Daimler gearset with direct drive on high gear



Upper left—The Weller transmission which has a minimum of splined shaft

Upper right—The Dux gear, probably the most compact four-speed direct drive transmission ever designed

Lower left—A direct drive gearset using silent chains employed by the London General Omnibus Co.

Lower right—Linley gear in which shifting is operated by withdrawing the clutch after the shaft lever has been moved

very complicated arrangement, but many thousands of these gearsets have been made and given excellent service.

As a comparison with these two early types, the British Daimler transmission forms a striking contrast. This is a four-speed gearset with direct on fourth, a separate sliding pinion not shown in the illustration being used to provide the reverse. A feature of this gearset, which is different from conventional American practice, is the great distance between the ball bearings at each end. The idea of course is to give the greatest possible rigidity to the main shafts. It is also noteworthy that no provision is made to relieve the annular bearings of end thrust.

The other gears shown are unconventional designs, all of which, however, have been used fairly extensively in England and have given good service.

The Weller gear has driving shaft *A* carrying a pinion and a jaw clutch at the left hand end. This shaft passes right through the extreme right end fitting inside a sleeve attached to the gear shown. This sleeve is the driven member, the shaft *A* ending as shown in the drawing. The two pinions shown at *B* are quite free on the shaft *A*, both to slide and to revolve but the double dog clutch *C* slides on keys or splines and therefore cannot rotate. The countershaft always has its right end pinion in mesh with the driven gear on the sleeve at the upper right to which the propeller shaft is attached. As shown, the gears are in neutral. Moving *C* to the right clutches shaft *A* to the end gear and so gives direct high speed. Leaving *C* where it is and moving *B* to the right gives the second speed, while moving *B* left leaving *C* where it is gives the first speed. It will be seen that all the stress of engagement comes upon the jaw clutches since in whichever direction *B* is moved its gears are meshed with those on the

countershaft before the clutches interconnect and so before any drive can pass.

The Dux gear is one of the most compact of any. Starting from the driving end *A* the pinion nearest the right is not attached to the shaft *A* which is free to rotate. The pinion at the left end is integral with the driven member *B* and the end of shaft *A* spigots within it as shown. On shaft *A* lying between the two gears just mentioned is a sleeve with two pinions. This slides on splines on shaft *A*. Moving the sleeve to the left causes the larger of the two wheels on it to mesh with an internal ring on the left pinion which is solid with *B*, so giving the direct drive. Moving the sleeve to the right picks up in similar manner the pinion at the right end, thus clutching this to the driving shaft *A*. Under these conditions the drive is transmitted to the countershaft *C* and so to *B*, just as in the conventional transmission. This gives the third speed.

The first and second speeds are obtained from the sleeves mounted on the countershaft, which are free to turn on the countershaft. These two pinions, which are separate, are each provided with internal teeth enabling them to be clutched to the corresponding pinions which are fixed to the camshaft. Moving the right hand one into engagement gives the lowest speed and the left hand one gives the second speed. The reverse is provided for by independent pinions not shown.

A transmission of an entirely different sort, which was first

designed for the British Commer truck, but has been manufactured for a good many years, is the Linley. This is a constant mesh gear and the various combinations obtained by the use of jaw clutches. It will be seen that the driving shaft *A* is not fixed to the pinion which drives the countershaft. Furthermore, that the gears on the driven shaft *B* are free to turn thereon, but the left extremity of *B* carries half of the jaw clutch which is fixed to it. A double faced jaw slides on splines on the right end of *A* and when this is moved to the right it clutches *A* and *B* solidly together, giving direct high gear drive. The countershaft is brought into operation by moving the clutch out of high gear position and as far as it will go to the left. Then we have the countershaft being driven steadily and can obtain the second and third speeds. The gear seen at the extreme right end is only used for reverse, there being another pinion not shown.

The particular and most ingenious feature of this gear is in the detail of the speed-changing mechanism. The shifter

forks which operate the clutches are mounted on shafts lying transversely across the box (up and down the page in the illustration) and rotation of these shafts which causes movement of the shifter fork is brought about by rotating the shaft *C* at the top of the box bearing peculiarly shaped cams.

The levers connecting the cams with the shifter forks are not rigidly connected with the shaft of the latter, a good stiff spring being interposed. Also the teeth of the jaw clutches are deeply undercut. Suppose now that one of the clutches is engaged and the engine is driving. If we now move the gear shift lever to the position corresponding to the next speed, we shall not be able to withdraw the clutch which is driving, and we shall merely compress the spring. Then as soon as the main clutch is withdrawn or the engine throttle shut the driving effort is relieved and the already compressed spring throws over the jaw clutch picking up the next gear ratio. The driver is thus enabled to select the next gear he wants to use in advance of the time when he desires to use it.

Aeroplane Wing Trussing

(Continued from page 382)

case, Fig. 36. Thus considering the two extreme attitudes, each of the trusses is either partly idle or has an extra strength and therefore weight.

In the single lift-truss the forces acting on the truss are almost independent of the center of pressure, as the reaction of the load at the root of the cantilever is equal to the load and independent of the bending arm.

Thus, the forces acting on a single lift-truss will be about 25 to 35 per cent smaller than the forces of which the front and rear trusses of the double system must take care in the worst cases. This will result in another considerable reduction of weight and air resistance.

Special Types of Side-Bracing

Fig. 38 shows a *K*-type side-bracing proposed by Capt. Martin (*Scientific American*, 1911). It is another interesting type of the single lift-truss that has all the advantages mentioned. Besides, as can easily be seen from the action of forces in Figs. 40 and 41, the extra bending moments in the *I*-type strut due to the cantilevers (sockets) are eliminated entirely. This advantage, however, is strongly jeopardized by the extra weight and resistance of the braces.

The Curtiss single lift-truss strut (Fig. 39), which is used in the wireless-truss biplane and in the new triplane (as far as it can be understood from the published details) is built up of two steel tubes, one straight, the other bent in two places; both tubes being inclosed by a covering. The character of cover determines whether this strut should be considered either as of the Martin's *K*-type, without the advantage of eliminating bending, or as a simple and cheaper type of the Dorner cantilever or *I*-strut type.

Finally the *X*-type side-bracing (Figs. 42 and 43) offers also certain advantages, especially as compared with the standard type (Figs. 28 and 29) and even with the *N*-type (Figs. 30 and 31), as it belongs in the double lift-truss class.

The advantage over the *N*-type is that there is one strut less. The advantage over any other double lift-truss system is that the amount of load carried by each truss is practically independent of the variation of the center of pressure, although there is a certain increase of the forces due to the angularity of the struts. (See action of forces in the two extreme cases in Figs. 44 and 45.) The trusses therefore do not have as much extra strength as in all the cases of two parallel lift-trusses.

The gain in resistance and weight is evidently somewhat smaller than in the case of *I*-strut, but in return the *X*-type side-bracing is adaptable to staggered biplanes and to large

big-chord wings. The *I*-strut, and in general the single truss, would offer too many constructive difficulties in these cases.

Possibilities in Biplane Construction

Numerous interesting and entirely new possibilities in biplane construction can be obtained by combining the types of trusses and side-braces previously described. Examples are:

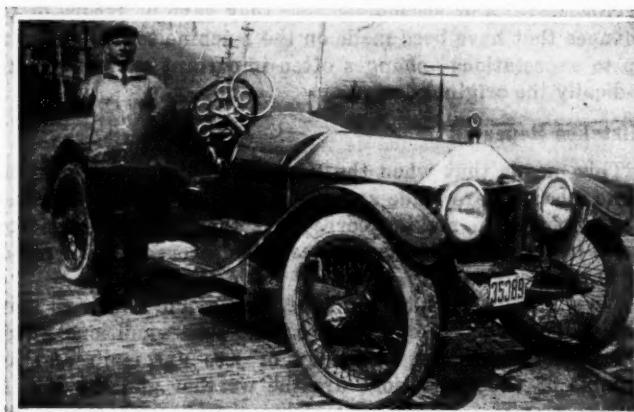
1. Wireless truss (Figs. 16, 17 or 18) combined with *N*-type bracing (Figs. 30 or 31) can be treated as (a) double lift-truss system or (b) single lift-truss system. In case *b* remarkable results can be obtained by placing the front and rear bars of the *N* in vertical planes parallel to the plane of symmetry of the airplane.

2. Wireless truss combined with *V*-type bracing can also be treated as (a) on a double lift-truss system or (b) on a single lift-truss system.

3. Wireless truss combined with the *I*-struts—an almost ideal structure for small fast machines.

4. Wireless truss combined with the *X*-type bracing, giving a construction with the least number of members for big-span and big-chord machines.

5. Strutless truss (Fig. 20 or 21) combined with the *X*-type bracing, and so on . . . as I do not attempt to exhaust, but merely to indicate the possibilities.



FRANK E. FITHEN of Steubenville, Ohio, who lost both arms in a railroad accident when 9 years old and his six-cylinder Oakland speedster. The gear lever is arranged to be operated by the foot and the steering wheel is fitted with a set of six brass rings forming sockets for Mr. Fitthen's arm stubs. These changes enable him to handle the car under all sorts of road and traffic conditions.

Standard Tests for Aeroplanes*

Development and Progress in Building Would Be Assisted by Better Testing Systems Better Co-related

By John J. Rooney †

ONE of the most serious questions confronting the aeroplane industry at present is: how can performance predictions be made more reliable? The importance of being able to predict the performance of a design with precision is brought home to us when we are informed that, during the past year, manufacturers have had considerable difficulty in obtaining with their machines the performance guaranteed to the Government in their contracts. This last feature is in itself serious, because it not only means much expense to the manufacturer, but also delay in the delivery of the machines to our Army and Navy, a condition, which, if prevailing during war time, would be a national calamity.

A brief analysis of some of our present methods may throw light on the causes of our trouble and possibly show us a solution of the problem.

The policy of the industry, generally, is to start the development of a new design by doing all the preliminary work in the best approved scientific manner. Laboratory tests are usually conducted with the highest degree of precision and the same scientific thoroughness is carried out in all the engineering work until the actual field testing is done, where carelessness occurs.

Wasteful Testing

It seems that it is the policy of some of the manufacturers to force successful performance regardless of the number of alterations in design required for the accomplishment. It is my opinion that in this particular we are making a grave mistake. The testing field is nearly always located some distances from the factory and the engineering staff; it is therefore impossible for the engineers to supervise all the changes that are made on the field and investigate the resulting difference in performance. Reliable records of engineering value are seldom kept on the field, and as a result the engineers are deceived regarding the performance of the machine: first, because they do not learn the truth about the performance; and, second, because they have no record of the changes that have been made on the machine to make it come up to expectations—changes often important enough to alter radically the original design.

Mistakes Repeated

This means that when the next aeroplane is designed the same mistakes are made and the same slip-shod field methods are employed in making corrections that would be incorporated in the design if the engineers had accurate information as to their advisability.

We shall now consider some of the ways in which an aeroplane's performance can be affected. Two conditions affecting performance that are more or less uncertain and are capable of wide variations are the weather and the skill of the pilot. The effects of varying weather conditions are obvious. The effect of the personal equation can best be shown by citing actual conditions. The low speed of an aeroplane varies inversely as the magnitude of the angle of attack (that is, for all fling angles), therefore, the higher the angle,

the slower the speed. By being able to take advantage of this peculiarity a skillful pilot can land a machine at a lower speed than can an amateur. The skillful pilot can also obtain a higher maximum speed and a better climbing rate by being able to take advantage of other similar peculiarities.

The speed of an aeroplane is a function of the wing shape and loading and is due to the thrust overcoming the resistance. The power developed by the engine depends on a number of different conditions. The performance of the propeller also depends on several variables. Therefore, since the performance of an aeroplane can be affected by so many variables it is preposterous for us to think we can continue conducting field tests in an unscientific way and at the same time make progress as rapidly as we should.

Standardize Field Test

What I have to suggest is that we standardize field tests as much as possible. The automobile engineers have found it necessary in the development of their engines to have a complete record of all the changes they make in design and the effect they have on the engine's performance. As a result, they can predict with a high degree of accuracy the result of this or that change. In order to facilitate the recording they have evolved standard forms that contain all the important data they desire to record. Since they have already accomplished much by these methods, and since we are striving to do the same, we should profit by their experience and conduct our tests in the same scientific manner.

It would seem that the sheet proposed for the S. A. E. Engine Testing Forms would be satisfactory for giving the engine specifications.

Our sad experience in Mexico last summer is enough to show the importance of knowing the conditions under which machines are to be flown. We should have reliable data on the climate and soil of every section of the United States, as these two conditions may at some time completely determine the design.

More Science Wanted

At present performance tests cannot be conducted as scientifically as we hope they will be in the future, owing to lack of proper instruments. The present instruments are nearly all non-recording, and are usually separate, which means that simultaneous readings are impossible. In some work, particularly in propeller designing, it is necessary to know the simultaneous velocity of advance, revolutions per minute and power absorbed. If correct values of these quantities are not known propeller designing is mere guess work.

An ideal arrangement of the instruments would be to mount them in one case and have one clock operate a recording device. If such a combination is not practical we should at least try to develop a recording air-speed indicator and tachometer, if for nothing more than to check our propeller computations.

Performance predictions can be made more reliable by satisfactorily checking our laboratory experiments with actual field tests. Whether we use the plan outlined above, or some other to furnish that check, let us by all means increase the value of our field tests.

*Paper presented at the First Aeronautic Session of Society of Automobile Engineers.

†Wright-Martin Aircraft Corp.

ACCESSORIES

New So-Luminum Compound

A WELDING compound that will mend defects in sheet or cast aluminum or build on new parts by the use of a gasoline torch has been brought out under the So-Luminum name. The repaired parts can be subjected to boiling water or steam without damage, it is stated. The compound also joins aluminum to copper and brass, making a joint stronger than the aluminum. No flux is required when using this compound. Another advantage in being able to use a gasoline torch for mending aluminum is that the metal is not weakened nor made brittle, while castings do not warp or fail to line up.—So-Luminum Mfg. & Engineering Co., 1790 Broadway, New York.

P. S. E. Plug Energizer

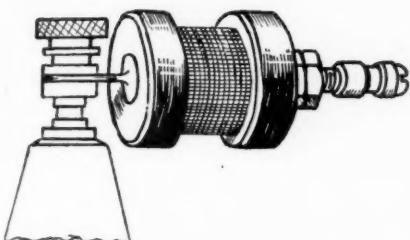
This device provides an auxiliary spark gap in the secondary circuit for the purpose of increasing the intensity of the spark. It is inserted between each spark plug terminal and the end of its secondary wire, and comprises a fiber frame holding the two electrodes forming the gap, all inclosed in a wire gauze case. The spark is visible and is claimed to be much hotter. Price, \$1.—P. S. E. Mfg. Co., 1777 Broadway, New York.

Varni-Shine

Varni-Shine is intended for cleaning and preserving the car finish. It is claimed to remove grease and dust and to impart a high finish. Price per half gallon, \$1.75; per quart, \$1; per pint, 50 cents.—Varni-Shine Co., Columbus, Ohio.

Bradford Gloves

Two styles of driving gloves are made by this company. The first, No. 916, combines two gloves in one, the plan being that the outer covering can be used independently as a lighter weight glove, if so desired. The inner lining is of stocking knit wool with a close-fitting wrist,



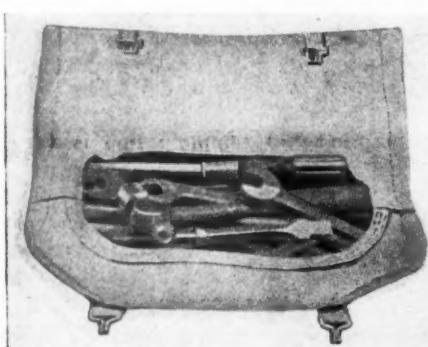
P. S. E. spark plug energizer for increasing the intensity of the spark



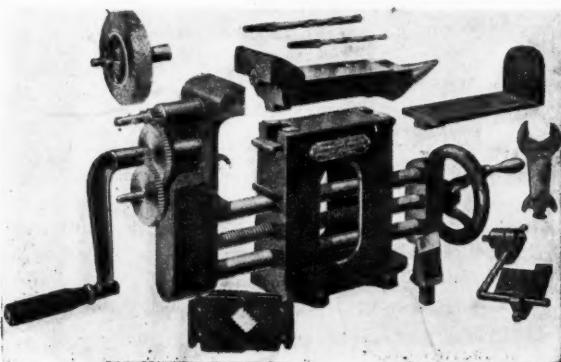
Two Bradford gloves, the lower having detachable woolen lining



Thermo-Kor manifold for Fords, which heats the incoming mixture



Temco tool bag, open and closed, showing compactness and method of carrying



The Stewart Handy Worker combines six tools in one machine for attaching to the work bench

over which is fitted a complete leather glove made of washable cape. The other glove, No. 1906, is a full fashioned sporting gauntlet made of washable cape. It has no seams at the wrist and is held by an elastic band. The lining is double-weight stocking knit. Price, No. 916, \$4; No. 1906, \$6.—R. E. Bradford, Gloversville, N. Y.

Thermo-Kor Heated Manifold

A special manifold for Fords in which the incoming mixture is heated by the exhaust gases. A hollow cord is cast integrally with the manifold and is piped to the exhaust, permitting the exhaust gases to pass through the center of the manifold. The performance of the motor in cold weather is bettered, it is claimed. Price, \$4.—Clark Gas Power Co., Herkimer, N. Y.

Temco Tool Bag

This is a cotton-duck fabric tool bag for the repairman or driver. Tools are all carried in one compartment having a large opening in the side, thus rendering the tools readily accessible. This opening is closed by a large flap held by two snap clasps, that permits quick opening and closing. The bag is carried by a heavy canvas handle. Price, \$1.25.—Temco Electric Co., Leipsic, Ohio.

Stewart Handy Worker

The Handy Worker is a bench fixture combining six machine tools in one. It comprises a two-speed drill press, grinding outfit, powerful vise and pipe vise, metal cutter and a sturdy three-speed machine for attaching and operating emery wheels, scratch wheels and buffing wheels. The weight of the outfit, boxed for shipment, is 90 lb. Price, \$12.50.—Chicago Flexible Shaft Co., La Salle and Ohio Streets, Chicago.

Insyde Tyre

This is a fabric reinforcement inserted between the inner tube and the casing. Several layers of tough fabric are vulcanized together over a tire mold and shaped to fit the inside of the casing. The Insyde Tyre has much the appearance of a casing with the tread and rims removed, made slightly smaller that it may fit the casing without wrinkles. The



Combination shovel and jack base to provide level jack footing

outer surface is coated with cement, which vulcanize itself to the casing and prevents slipping. It is claimed that the use of the reinforcement will prolong the life of a tire from 1000 to 5000 miles. Prices, 3 in., \$4; 3½ in., \$4.75; 4 in., \$5.75; 4½ in., \$7.25; 5 in., \$9. The above prices refer to diameter of tire section, and do not mention wheel diameter. A 4-in. Insyde Tyre will fit 32 by 4, 33 by 4, 34 by 4 and other 4-in. sizes.—American Automobile Accessories Co., 621 Main Street, Cincinnati, Ohio.

Shovel and Jack Base

Combining use as a shovel to prepare a level footing for a jack on a rough road and as a flat base beneath the jack, this device is made of heavy galvanized steel, weighs 1½ lb., and measures 9 by 6 in. It is claimed to be particularly useful in replacing wire wheels, as a secure jack base is essential. Price, 50 cents.—Laconia Car Co., 60 Congress Street, Boston.

F. & R. Car Vise

This vise is of the swiveled-base type, with a clamp for attaching to the running board of a car. The jaws are steel-faced and tempered, 2 in. in width, and may be opened 2 in. The weight is 7½ lb., and the construction very compact, permitting the vise to be carried beneath the rear seat. This vise can be adjusted to any position, and both swivels are locked when the work is clamped between the jaws. Price, \$8.50.—Fulton Machine and Vise Co., Lowville, N. Y.

Safety Radiator Emblem

This radiator emblem bears the words "Safety First" in raised white enamel letters on a medium green background, this shade being the official color of the Safety First organization. The rim and base of the emblem are of polished nickel, and it may be attached to any radiator cap. It sells for 75 cents.—Stevens & Co., 375 Broadway, New York.

Honn Babbitting Jig

This jig is designed for babbitting connecting-rods and also for determining the true alignment of the two pins. A metal base carries two fixed uprights holding the crankpin bushing, and adjustable V-block carrying the wristpin bushing. Four shafts and eight collars are furnished to fit various sizes of connecting-rods, the piston pin being used for the



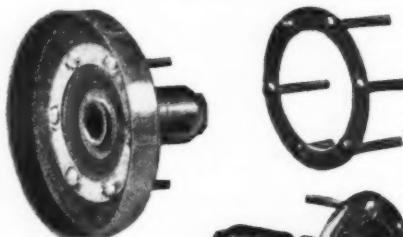
F. & R. car vise for attaching to the running board. It is adjustable



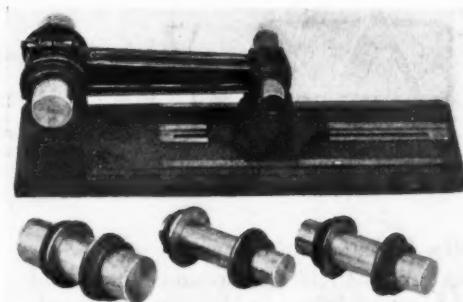
Safety First emblem for mounting on the radiator



Hand signal lamp which is secured to the hand by an elastic band



Details of Simplicity demountable wheel for Ford cars



Honn Babbitting Jig. This device is also useful for aligning bearings

upper end of the rod. All parts are made very accurately and permit the jig to be used for obtaining true alignment of the pins. Price, babbitt jig, \$9; furnace, \$2; ladle, 75 cents; blowtorch, \$4. Set complete, \$15.—Honn & Son, 578 Stocking Avenue, N.W., Grand Rapids, Mich.

Hand Signal Lamp

This electric lamp makes the extended hand of the driver a conspicuous signal at night. It is held to the back of the hand by an elastic and receives current from the dash socket. The lamp is 2 cp., and is held in a nickel case 2 in. in diameter, 1 in. thick, with a ruby bull's-eye 1 in. in diameter. As very little current is required, the lamp is left lighted.—Pittsburgh Electric Specialties Co., Pittsburgh, Pa.

Simplicity Demountable Wheel

For providing a quick wheel change for Ford cars special hubs are placed on the axles, these hubs having projecting bolts to which the Ford wheels are readily bolted or removed. The installation requires that the wheels be removed, the special hubs substituted and an inner flange bolted to the inside of the wheels to take the place of the hubs removed. An extra wheel, a side carrying bracket and all tools for the change are included. It is said that the change may be made in 4 min. The device sells for \$15, complete.—Simplicity Demountable Wheel Co., Grand Rapids, Mich.

Perfection Motor Robes

Perfection motor robes are made of black plush with black Russian bear cub lion, and in other styles to suit. Three stock sizes 48 by 60 in., 54 by 66 in., 60 by 70 in., are offered.

The construction of these heavy fur-lined robes is said to be so exceptionally durable that the complete line is very well suited to the automobilist's requirements. Lockstitch sewing, turned fur edges, reinforced borders, and selected fur skin, are some of the features. Also each robe carries a metal identification tag, the number being registered with the makers, facilitating recovery if lost.—Perfection Robe Co., 12 South Market Street, Chicago.

Industrial Miscellany

Factory

Ford Motor Co. will increase its output at the Milwaukee plant from 90 to 135 cars daily. The maximum capacity of this factory is 180 cars per day.

Menominee Motor Truck Co., Menominee, Wis., has been invited to move its plant to Green Bay, Wis., by the business men of the latter city who are raising a guaranty fund of \$125,000 to effect the removal.

Auto Specialty Co. will commence production at St. Joseph, Mich., shortly. The company recently moved its plant, with 330 workers and their families, from Joliet, Ill.

McIntyre Co., Chicago, manufacturing the famous commercial truck, is looking for a location in some inland city of Illinois or other state adjacent to Chicago. A factory site is sought which has adequate railroad facilities.

Herschell-Spillman Co., North Tonawanda, N. Y., will occupy the major part of its new factory building within the next 2 weeks.

Allen Motor Co., Fostoria, Ohio, is laying out building sites and streets for the workers at its new factory expansion on the outskirts of the city. The automobile community planned will be known as Allendale Addition.

Vassar Stamping Works has been incorporated for \$31,500 at Vassar, Mich., to manufacture automobile parts. J. E. Faber, R. A. Crowbar and Q. J. Spear are the incorporators.

Turner Mfg. Co., Port Washington, Wis., manufacturer of gasoline engines and power farm machinery, is now producing tractors. Orders for more than 1000 machines are on the books.

Dundore Mfg. Co., Reading, Pa., has been incorporated at \$75,000 to make automobile parts and accessories. The incorporators are Charles S. Dundore, Edwin Smith, W. Stewart Wray, and D. Elmer Worley.

Beaver Dam Casting Co., Beaver Dam, Wis., has been organized with a capital stock of \$10,000 to lease the plant of the former Gray Iron Foundry Co., Beaver Dam, and specialize in cast and

semi-steel for the automobile and engine trade. The company now employs between 125 and 150 men.

Ladish Drop Forge Co., Cudahy, Wis., is rushing work on a large shop addition. The company produces cranks, cam-shafts, and other automobile parts.

The Kerosene Motor and Tractor Co., St. Louis, has been organized to sell the Peoria and Parrett tractors. The new company is a subsidiary of the Weber & Damme Wagon Co.

Personals

Andrew Langerbacher has been appointed sales manager of the Duplex Truck Co., Lansing, Mich. He was formerly with the sales department of the Reo Motor Car Co.

H. E. Heimberger has been appointed assistant manager of sales of the automobile department of the Vacuum Oil Co., Indianapolis, to succeed C. B. White, who has been promoted to the superintendency of the company's branch at Des Moines, Iowa.

The Automobile Calendar

CONTESTS 1917

April—Los Angeles to Salt Lake City Road Race.
May 19—New York Metropolitan Race on Sheepshead Bay Speedway.
May 30—Indianapolis Speedway Race, Championship.
June 9—Chicago, Ill., Speedway Race, Championship.
June 23—Cincinnati, Ohio, Speedway Race.
July 4—Omaha, Neb., Speedway Race, Championship.
July 4—Tacoma, Wash., Speedway Race, Championship.
July 14—Des Moines, Iowa, Speedway Race, Championship.
Aug. 4—Kansas City Speedway Race.
Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.
Sept. 15—Providence, R. I., Speedway Race, Championship.
Sept. 29—New York, Speedway Race, Championship.
Oct. 6—Kansas City Speedway Race.
Oct. 13—Chicago, Speedway Race.
Oct. 27—New York Speedway Race.

SHOWS

Feb. 7-15—Chicago Cement Show, Coliseum, Cement Products Exhibition Co.
Feb. 10-17—Harrisburg, Pa., Harrisburg Automobile Dealers' Assn., J. Clyde Myton, Mgr.
Feb. 10-17—Hartford, Conn., Show, State Armory, First Infantry.
Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgreen, Mgr.
Feb. 12-17—Bay City, Mich., Show, Armory.

Feb. 12-17—Kansas City, Mo., Second Annual Tractor Show, Union Station Plaza.
Feb. 12-17—Kansas City, Mo., Kansas City M. C. Dealers' Assn.
Feb. 12-17—Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.
Feb. 12-17—Toledo, O., V. G. Kirby, 1017 Jefferson Ave.
Feb. 12-19—Indianapolis, Ind., Show, Steinhart Bldg., Indianapolis Automobile Trade Assn.
Feb. 13-15—Grand Forks, N. D., Auditorium, Automobile Dealers' Assn.
Feb. 13-17—Williamsport, Pa., Armory, John Kelly, Mgr.
Feb. 14-17—Peoria, Ill., Coliseum, Automobile and Accessory Dealers' Assn.
Feb. 15-17—Racine, Wis., Chas. A. Myers, Mgr.
Feb. 17-24—Albany, N. Y., Sixth Annual, State Armory, Albany Automobile Dealers' Assn.
Feb. 18-25—St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.
Feb. 19-24—Springfield, Ohio, Show, Memorial 1 Hall, Springfield Automobile Trade Assn.
Feb. 19-24—Pittsfield, Mass., Show, Armory, J. J. Callahan, Mgr.
Feb. 19-24—Portland, Me., Exposition Building.
Feb. 19-24—Grand Rapids, Mich., Show, Automobile Business Assn. of Grand Rapids.
Feb. 19-24—Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.
Feb. 19-24—South Bethlehem, Pa., Show, Coliseum.
Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.
Feb. 19-24—St. Louis, Overland Bldg., St. Louis, Auto Dealers' Assn.
Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.
Feb. 19-24—Pittsfield, Mass., J. J. Callahan, Mgr.
Feb. 20-24—Salt Lake City, Utah, Inter-Mountain Automobile Show, Bonneville Pavilion, W. D. Rishel, Mgr.
Feb. 21-24—New London, Conn., Armory.
Feb. 21-24—Flint, Mich., Coliseum, Lake Side Park, E. W. Jeffers, Mgr.
Feb. 21-24—Trenton, N. J., Armory, Trenton Automobile Trade Assn.
Feb. 24-Mar. 3—Newark, N. J., Show, First Regiment Armory.
Feb. 24-Mar. 3—Brooklyn, Show, 23rd Regiment Armory.
Feb. 24-March 3—Atlanta, Ga., Automobile Dealers' Assn., Auditorium.
Feb. 26-March 3—Great Falls, Mont.
Feb. 26-March 3—Omaha, Neb., Show, Auditorium, Omaha Automobile Show Assn.
Feb. 26-March 3—Utica, N. Y., Utica Automobile Dealers' Assn., State Armory.
Feb. 26-March 3—Wilkes-Barre, Pa., Hugh B. Andrews, Mgr.
Feb. 27-March 4—Atlanta, Ga., Show, Auditorium, Atlanta Auto Trades and Accessory Assn.
March 1, 2, 3—Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co., Armory of the University of Ill.
March 3, 4, 5—Green Bay, Wis., Show, Green Bay Automobile Dealers' Assn.
March 3-10—Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.
March 3-10—Washington, D. C., Middle Atlantic Motor Assn., Inc., Union Bldg.
March 5-10—Jamestown, N. Y., Jamestown Automobile Dealers' Assn., Armory, C. A. Hanvey, Mgr.
March 5-12—Birmingham, Ala., Auditorium.
March 6-9—Fargo, N. D., A. Hanson, Mgr.
March 6-10—Fort Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.
March 7-10—St. Joseph, Mo., Auditorium, St. Joseph Automobile Show Assn.
March 12-17—Vancouver, B. C., British Columbia Automobile Assn., Horse Show Bldg.
March 13-16—Fargo, N. D., Armory and Auditorium.
March 14-17—Mason City, Ia., Armory, Mason City Automobile Dealers.
March 14-17—Davenport, Iowa, Show, Coliseum Bldg., Tri-City Auto. Trade.
March 17-21—Manitowoc, Wis., F. C. Borchert, Jr., Mgr.
March 17-22—New Haven, Conn., Show, Hotel Taft, J. Bell, Mgr.
March 18-23—Cedar Rapids, Ia., Cedar Rapids Automobile Trades Assn.
March 19—Paterson, N. J., Sixth Annual, Auditorium, R. A. Mitchell, Mgr.
March 21—Trenton, N. J., Second Regiment Armory, J. L. Brock, Mgr.
March 27-31—Deadwood, S. D., Fifth Annual, Deadwood Auto Show, J. E. Nelson, Mgr.
March 31-Apr. 14—Atlantic City, Garden Pier, S. W. Megill, Mgr.
April—Calumet, Mich., Show, Coliseum, Frank Ketchell, Mgr.
Apr. 4-7—Stockton, Cal., Second Annual San Joaquin Auto Trades Assn., Samuel S. Cohn, Mgr.
Sept. 2-9—Spokane, Wash., Interstate Fair.

C. T. Bird has been appointed vice-president and works manager in charge of engineering and production of the Pangborn Corp., Hagerstown, Md. He resigned from the Mott Sand-Blast Co. Jan. 1. He was sales engineer for Pangborn, which makes sandblast and allied equipment, some years ago.

A. E. Morrison has accepted the position of Western sales manager for the Rainier Motor Corp., Flushing, N. Y. He has been for the past 4 years with the Maxwell company.

W. H. Barcus will manage the new Cleveland district for the Fisk Rubber Co. This includes Toledo, Lima, Columbus, Youngstown, Dayton, Cincinnati and Pittsburgh. Mr. Barcus has been manager of the old Cleveland Fisk district.

R. D. Northrup has joined the sales staff of the Greenleaf Co., Boston. He was formerly advertising manager of the Standard Woven Fabric Co.

Harry A. Stevenson has decided to devote all his time to the Michigan State Auto School as vice-president. He has been interested in the institution for some time, and has been allied with the Detroit Electric Co.

F. A. Snow is now in business for himself as a consulting metallurgist, with headquarters in Chicago. He is planning to establish a commercial heat-treating plant there. He left his position as chief metallurgist of the Thomas B. Jeffery Co., Kenosha, Wis., on Feb. 1.

M. C. Manship has been appointed manager of the Philadelphia branch of the Maxwell Motor Sales Corp. He was formerly with the New York branch.

H. J. Newman has taken a position in the sales department of the Garford Truck Co., Lima, Ohio. He was formerly assistant sales manager of the Atterbury Motor Truck Co.

J. W. Clower has been made sales manager of the Bush-Morgan Motor Co., Kansas City, Mo., distributors of Paige and Dort. Mr. Clower has been salesman with the firm for a year.

Samuel L. Chorlines, St. Louis, recently with the United States Tire Co., has been made manager of the Independent Tire Co., that city.

L. C. Parrott has taken the position of purchasing agent of the Otis Steel Co., Cleveland. He formerly held a similar office with the Standard Parts Co.

Dan F. White has been appointed southern district manager for the Firestone Tire & Rubber Co., Akron, Ohio.

O. O. Dice has joined the sales force of the Cuyler Lee organization of San Francisco as sales manager of the Maxwell branch of that company.

L. Z. McKee has been appointed manager of the Gibson Co. branch house at Lafayette, Ind. Mr. McKee has been with the Gibson organization for several years.

D. V. Kennedy, formerly the sales manager for the Candler Radiator Co., Detroit, has been appointed manager of the Detroit branch of the Perfex Radiator Co., Racine, Wis.

Robert F. Black, formerly with the factory of the International Motor Company at Allentown, has been made manager of the Philadelphia branch, handling Mack and Saurer trucks.

F. Finch will have complete charge of the retail sales of the Overland company's Winnipeg, Man., branch.

D. J. O'Keefe, formerly sales manager in Texas for the General Roofing Co., has become sales manager for the Harry Newman, Inc., of St. Louis.

F. P. Fentress of Seattle has taken the Western Washington agency for the Peerless cars and trucks.

George C. Newell has been appointed western Washington agent for the Savage Tire Co. of California.

Louis Logie and **Louis Livingstone** have been appointed general sales manager and eastern Canadian manager respectively of the Maxwell Motor Co. of Canada, Ltd.

R. D. Oilar and **W. M. Edwards**, of Indianapolis, will handle Crow-Elkhart for Indianapolis and Marion counties.

L. A. Poundstone has succeeded C. B. McLaughlin as manager of the Maxwell branch at Kansas City. Mr. Poundstone was formerly at the factory.

E. M. Marcus has been made assistant to the treasurer and manager of the auditing and public accounting divisions of the Wallace C. Hood Service Bureau, Detroit.

J. E. Breakey, of the purchasing department of the King Motor Co., Detroit, has been promoted to the position of cashier and office manager of the company.

Dealers

Federal Rubber Co., Atlanta, Ga., branch has been opened. E. L. McCaffrey, formerly manager of the Philadelphia branch, is in charge.

Hubbel-Oakes Motor Co., Atlanta, Ga., has added the Commerce trucks to the line of passenger cars. The company has the State agency.

Willys-Overland Co. has opened a used car department in Atlanta, Ga. Frank North is in charge.

Blount Carriage & Buggy Co., Atlanta, Ga., will sell the Woods Dual Electric Cars.

Anderson Motor Sales Co., Birmingham, Ala., has taken over the agency for Briscoe cars from P. J. Macalpine. The Anderson Co., of which J. A. Carr is president, will handle Mack trucks.

Geo. A. Morse, Inc., Minneapolis, has succeeded to the Tri-State Automobile Co. It thus acquires the Northwestern distribution of the Inter-State car. The St. Paul agency has been taken by the Oldsmobile Co., 343 N. Exchange Street.

D. W. Young Motor Car Co., Atlanta, Ga., has opened a salesroom and service station in Montgomery for Packard cars. I. Griffith of Birmingham, will be in charge at Montgomery.

P. J. Durham Co. New York employees will participate this year in the earnings of the company figured on a basis of 5 per cent of the total compensation received by each one during the past year. This company gives service on Gray & Davis, Electric Auto-Lite and Willard Electric systems.

International Truck Sales Co., selling agents for the I. H. C. truck, Kansas City, Mo., has moved from the West Bottoms implement district to Motor Row.

Larabee-Deye Truck Co., of Binghamton, N. Y., will soon have an agency in Kansas City, under the management of B. F. Hanna.

Bates Steel Mule Tractor Co.'s agency at Kansas City, Mo., has moved to 1708 Grand Avenue. C. H. Bently is sales manager.

Topeka Buick Co., Topeka, Kan., has bought property and will build to secure 100 per cent more floor space.

Dougherty Motor Co., Kansas City, Mo., will have the Allis-Chalmers tractor at its headquarters, following an arrangement with A. L. Palmer, who has had charge of Allis-Chalmers tractors in this territory.

Buxton-Phillips Motors Co., Kansas City, Mo., has incorporated, \$10,000 paid, and opened a Chalmers agency. Incorporators are H. G. Kirkland, Kirkland-Daley Motor Co., sales agency of Studebaker; F. D. Phillips, formerly wholesale sales manager of the Willys-Overland, Kansas City, and L. A. Buxton, formerly salesman, Kirkland-Daley Motor Co.

Seattle Motor Car Dealers' Assn. elected the following officers at its annual meeting in the Arctic Club building: A. G. Schaefer, president; William L. Eaton, vice-president; J. A. Osmond, secretary; M. S. Brigham, treasurer, and F. L. Rockelman, trustee.

United Tire Co. has opened a branch in Seattle, which will handle the territory of Oregon, Montana, Idaho, Alaska, British Columbia and Washington.

J. W. Leavitt Co., of California, has taken the Pacific Coast agency for the Harroun car. The company has until recently been the Coast distributor for the Overland car.

H. W. Moore & Co. of Denver, Billings, Mont., and Salt Lake City, has been named as distributor in the west for Ohio trailers, made by the Ohio Trailer Co., Cleveland.

L. M. Cotton, Inc., has been appointed New England representative of Ohio trailers.

E. Edelmann & Co., Chicago, has established offices, a sample room, and stock room at 119 West 42nd Street, New York, in charge of A. R. Klein. A complete line of Edelmann accessories will be carried at this office.

Mall Motor Co. has been incorporated at Columbus, Ohio, to distribute Ford cars for this district. The incorporators are: W. C. Malin, J. A. Cline, and M. A. Patterson, all of Columbus.

Tritt & Gockley, Canton, Ohio, have been appointed distributors for Amazon Tire & Rubber Co. products with exclusive selling rights in Stark and Tuscarawas counties.

Sun Motor Co., of Philadelphia, has been formed to handle the Sun car. The company has located at 514 North Broad Street, and has branches in Mount Union and Huntingdon where it distributes the Ford and Overland. The officers are R. B. Cassady, president and general manager, and LeRoy Closson, sales manager.

Anchor Auto Co., St. Louis, has been organized to sell the Commerce truck. J. B. Felkel is manager and salesrooms are at 4274-4276 Easton Avenue.

Gibson Electric Garage & Storage Battery Co. has taken the agency in Portland, Ore., for the Owen-Magnetic car.

Kinney Motor Car Co., Eau Claire, Wis., recently organized, with a capital stock of \$50,000, has taken quarters at South Barstow and Grey Streets, and will be northwest Wisconsin distributor of the Mitchell, Maxwell and Oakland. Thirty sub-agencies already have been established.